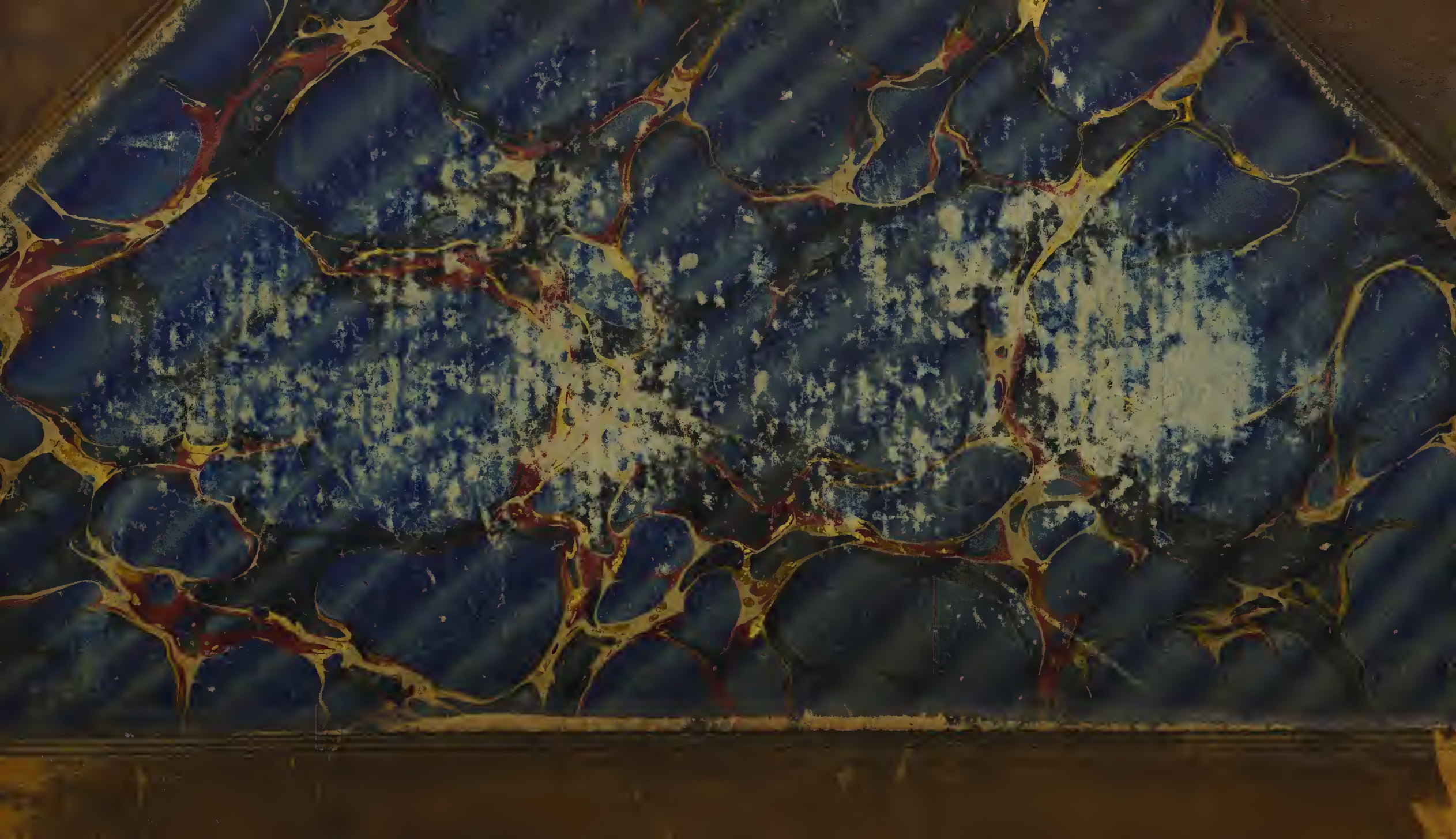

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THE PHARMACEUTICAL JOURNAL.

SECOND SERIES.

VOL. II.—No. I.—JULY 2nd, 1860.

THE OBJECTS OF THE PHARMACEUTICAL SOCIETY, AND PROVISIONS FOR CARRYING THEM INTO EFFECT.

The extensive alterations which are being made in the premises occupied by the Pharmaceutical Society for the purpose of improving the accommodation for carrying out some of the objects of the Society, cannot fail to elicit frequent inquiries as to what the objects are for which such provision is required. These alterations were projected and commenced chiefly with a view to the extension and improvement of the laboratory, but as the formation of the new laboratory necessitates a change in other parts of the establishment, the result will be an almost entire rearrangement of offices, with greatly increased accommodation in every department. Hitherto the laboratories and lecture-room have been distributed through different parts of the building. The principal laboratory on the basement floor was contracted, ill ventilated, and badly lighted; it afforded accommodation for twenty-one pupils, and was usually devoted to synthetical operations. The laboratory for analysis was on the second floor, and was capable of accommodating twelve pupils. This room was also badly ventilated and lighted. The professors' laboratory and the lecture-room were on the first floor, intermediate between the upper and lower laboratories, and contiguous to the library. As a consequence of this arrangement, every part of the building was subject to the injurious effects of the gases evolved in chemical operations, and not only were these effects experienced on books and other property, but the atmosphere of the house was so far contaminated that a separate residence had to be provided for the Secretary. The imperfections in these arrangements may be ascribed in great measure to the fact that the different departments of the Institution have undergone progressive development, and the provisions made for them have been extended from time to time to meet increased requirements.

The house, No. 17, Bloomsbury Square, was taken in 1841, soon after the formation of the Society, of which it was the first "local habitation." It was here the operations of the Society were commenced, in accordance with the objects originally set forth, and thus expressed in the "Laws and Constitution:"—

"The Pharmaceutical Society is instituted for the purpose of uniting the Chemists and Druggists into one ostensible, recognized, and independent body—for protecting their general interests—and for the advancement of Pharmacy, by furnishing such a uniform system of education, as shall secure to the profession and the public the safest and most efficient administration of medicine."

The house taken for the Society had originally formed part of a nobleman's mansion, the latter having been divided into three houses when, from the migration of fashionable life towards the west, it became necessary to seek a different class of tenants for the houses in Bloomsbury. Ample accommodation, however, was found for the newly-formed Society in 17, Bloomsbury Square. The largest room in the house was set apart as a lecture-room, the next largest as a museum, and the next as a library. There were also a good Council-room, Secretary's office, and dwelling-rooms for the Secretary and servants.

On the 12th of January, 1842, the first meeting of the Society was held in its new house, and an address from the pen of the first President of the Society,

William Allen, F.R.S., was read by Mr. Payne, the Vice-President. In this address the objects of the Society, and the proposed mode of carrying them into effect, were explained, and the importance of providing not only for the scientific education of students in pharmacy, but also for the professional advancement and elevation of those already in business, by the establishment of a museum, library, lectures, and a scientific Journal devoted to pharmacy, were strongly and ably advocated.

On the 16th of February, in the same year (1842), the first lecture, introductory to a course of lectures on Materia Medica, was delivered by Dr. A. T. Thomson, and was followed by introductory lectures on Chemistry and Practical Pharmacy, but the complete courses of lectures on these subjects did not commence until October. Meanwhile a course of lectures on Botany was delivered in May, June, and July. These lectures were well attended, many Members as well as Associates having entered to each of the courses.

In 1843 the examinations commenced, and eighty-two students passed the classical and minor examinations in that year.

The Museum and Library were now in course of formation, a large number of books and specimens having been presented by Members and friends of the Society, but each of these departments found ample accommodation in the room set apart for it.

Provision having thus been made for carrying out the several objects contemplated in the establishment of the Society, a charter of incorporation was applied for and obtained; and the fact that this public recognition of the Society was granted within two years from the time of its formation, was considered to be a satisfactory indication of the favourable opinion entertained by the Government with reference to what had already been done.

From this time rapid progress was made in extending and further developing the Society's operations. The Museum and Library were daily receiving additions; the arrangements for the lectures were made with a view to their affording the best attainable instruction on the subjects taught. Mr. Fownes was the lecturer on Chemistry, Dr. Pereira on Materia Medica, Dr. Anthony Todd Thomson on Botany, and Mr. Redwood on Pharmacy. Besides these class lectures, which were delivered in the morning, courses of lectures were also delivered in the evening, and some of these attracted audiences for which the lecture-room afforded inadequate accommodation.

In connexion with the educational arrangements there was still felt to be one deficiency, and that was the want of means for affording practical instruction to students in a laboratory arranged expressly for such purpose, where the pupils might be engaged throughout the day. Applications were frequently made to the Society in reference to this want, and the Council, therefore, fitted up a room on the second floor of the house, the present upper laboratory, which was opened in October, 1844, with a class of ten pupils—the greatest number for which accommodation had been provided. The success of the first year's operations in this department induced the Council to fit up another and larger laboratory in the basement of the house, which was opened the following year (1845), and the number of pupils was now increased to twenty-seven, and soon afterwards rose to about forty.

These arrangements were continued for many years without material alteration, and there is every reason to believe that the operations of the Society would have been marked by uninterrupted rapid progress in each of the departments referred to, had it not unfortunately happened that dissension sprung up among some of the Members, who succeeded in embroiling the Society in lengthened and expensive litigation, during the continuance of which there was a very perceptible falling off in the support of the School, and indeed of all the operations of the Association. The unanimous decision of the law courts having at length been given in favour of the Council, the clouds which had overcast the horizon cleared away, and renewed zeal was infused into the

prosecution of the important and legitimate objects for which the Institution had been founded.

Efforts had in the mean time been made to obtain an Act of Parliament, giving to the Society a legal recognition and a firmer basis, and this was obtained in 1852, through the great exertions of Mr. Jacob Bell. Although the Pharmacy Act did not effect all that was desired by its promoters, it nevertheless gave to the Pharmaceutical Society powers and importance which it did not previously possess. The Society was now looked upon as one of the firmly established institutions of the country, having important duties assigned to it by the Legislature, and requiring for the right exercise of these duties a well-appointed and commodious establishment.

The house, No. 17, Bloomsbury Square, had ceased to afford sufficient accommodation for the growing requirements of the Society. The room occupied as a museum had long been filled with specimens, and as the number of these was daily increasing, it became necessary to seek a place for them elsewhere. Cases were fixed in the Council-room and Secretary's office, and these also were soon filled and found insufficient. The extensive and valuable collection of the late Dr. Pereira having come into the possession of the Society, there were materials for making a Museum of Materia Medica worthy of a national institution representing British Pharmacy; but it was obvious that the premises occupied by the Society did not afford means for the display of such a collection. Nor was it in reference to the Museum alone that this deficiency was experienced. Further space was equally wanted for the Library, the number of books having outgrown the provision made for them, and the room used as a library being found too small for the purpose. Increased accommodation was also wanted for the apparatus used in the lectures. Much valuable apparatus was destroyed or greatly injured for want of suitable means of preserving it. Hitherto it had been stowed away in the attics, without any glass-cases for its protection. The lecture-room, although sufficiently large for the class lectures, was not capable of accommodating such an audience as would be attracted to popular lectures on special occasions, and it was frequently urged that such lectures, relating to the advancement of pharmaceutical knowledge, should be given at such times as would suit the convenience of Members of the Society and their friends. Then there was no suitable room in which to conduct the examinations, and this deficiency continued to be more strongly felt as the examinations increased in importance, and assumed a more practical character. In addition to all these wants, there was the growing want of accommodation for the laboratory class, which continually forced itself, in potent whiffs of noxious fumes, upon the attention of the Council.

For several years past it has been felt that to enable the Society fully to develop its resources, and to take the position which properly belonged to it, it would be necessary either to find new premises in which to carry on its operations, or to extend and entirely remodel those hitherto occupied. Propositions were made for getting a new building erected, but it was found that this would involve the expenditure of a large sum of money, and it was not easy to get a suitable site; moreover, the Society had become identified with Bloomsbury Square. While this subject was under consideration, an opportunity was offered for obtaining, on very favourable terms, the whole block of building, the original mansion, of which 17, Bloomsbury Square, constituted less than one-half. This opportunity was not lost, and the Society now have the whole of the premises on lease for about ninety years. They afford, with the additions about to be made, the means for providing all the accommodation required. The first use made of the newly-acquired part, was for extending the Museum, which was done about fifteen months ago. There were then three tenants retained in other parts of the building. But further provision was required for the library, the lectures, the examinations, and for the residence of the Secretary;

and the much debated question of the best means of providing for the laboratory class remained to be settled. The prevailing opinion was in favour of turning the laboratory out of the house, and attempts were made to get premises either adjoining the establishment or within a short distance of it, where a laboratory could be fitted up; but all these attempts proved abortive.

The plan of making the laboratory at the top of the house was first suggested as an expedient when other plans had failed; it appeared the only practical means of accomplishing what was required. Many objections were urged against it, but these gradually gave way, and at last the proposition received the unanimous assent of the Council. The new laboratories will be an extensive suite of lofty rooms, well lighted, and with ample provision for ventilation. The whole, including the professors' laboratory, will be on one floor, the access to which is by a stone stairs distinct from that communicating with other parts of the house. All laboratory work will thus be removed from the lower and middle parts of the building, and will be as completely turned out of the house as if the laboratory had been transferred to adjoining premises.

In connexion with this alteration another will be made by which a good lecture-room will be provided. The lower laboratory, being no longer required as such, will, together with the Council-room and Secretary's office, be converted into a lecture-room capable of accommodating four hundred persons. This will be on the ground floor, contiguous to the Museum, and in a position in every way well suited for the purpose. Two great wants will thus be amply provided for, and these the requirements involving the greatest difficulties. The laboratories being placed at the top, in the open air, and cut off from communication with the offices beneath, and the lecture-room being at the bottom where the principal laboratory formerly was, the old lecture-room will be available for other purposes, and will probably be fitted up for the use of the Council and the Board of Examiners. On the same floor with this room, the first floor of the house, there are five other large rooms which will afford ample accommodation for an enlarged library, Secretary's office, apparatus-room, and dwelling-rooms for the Secretary. On the floor beneath there will also be space available for extending the museum; and thus all the requirements of the Institution will be provided for.

During the progress of these alterations, affecting as they do every part of the establishment, the business of the Society is necessarily, to some extent, impeded. It has been found necessary to close the library, partly to dismantle the museum, and to make temporary arrangements for the laboratory class during the remainder of the present session. It is hoped, however, that the new arrangements will be completed before the commencement of next session, when not only the students, for whom, through the liberality of the late Jacob Bell, a splendid suite of laboratories will have been provided, but also the Members and patrons of the Society, who have so disinterestedly contributed to support the educational department of the Institution, will find greatly improved and extended provisions in every department for carrying out their mutual object of advancing the progress of pharmaceutical knowledge, and elevating the professional position of the body to which they belong.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, 6*th June*, 1860,

Present—Messrs. Bird, Bottle, Davenport, Deane, J. B. Edwards, Evans, Hanbury, Haselden, Herring, Hills, Lescher, Meggeson, Sandford, Standring, and Waugh—being the first meeting after the anniversary—the following Officers of the Society were elected :—

THOMAS N. R. MORSON .....*President.*
PETER SQUIRE .....*Vice-President.*
DANIEL BELL HANBURY .....*Treasurer.*
ELIAS BREMRIDGE was also re-appointed *Secretary and Registrar.*

The following were elected

MEMBERS.

LONDON .....Guyer, James Brett
" .....Robbins, John
NORTHAMPTON .....Clarke, William Richard

MAJOR EXAMINATION, 19*th June.*

Church, Henry J. ...London
Hall, Thomas H. .....Southampton
Lawrence, Henry.....Stratford, Essex
Long, Alfred Thorby .....Brighton
Long, Henry .....London
Renaud, Desiré M.....Clapham

MINOR EXAMINATION.

Bass, James ....London
Burton, John .....Nottingham
Oliver, John Gerry .....Holsworthy
Sims, Francis M. B. .....Colchester
Symes, Charles .....Thornbury
Wells, Edwin.....Ludlow

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS.
Allen, Edward Ransome	Messrs. Chapman	Ipswich
Allen, Samuel Stafford	Mr. Beale	Hemel Hempstead
Bonnett, Frederick	Mr. Price	Bridgend
Bullock, Frederick	Mr. Parkes	Manchester
Carr, John	Mr. Scarrow	Sunderland
Clayton, Francis Corder	Messrs. Harvey & Reynolds	Leeds
Dale, George	Mr. Hughes	Altrincham
Green, Edwin George	Mr. Greaves	Bakewell
Harris, Henry William	Messrs. Ford and Miller	Reading
Livermore, George	Mr. Goodger	31, Regent Street
Llewelyn, Peter	Mr. Phillips	Carmarthen
Parkes, Robert	Mr. Townsend	Burton-on-Trent
Pratt, Joseph	Mr. Loggin	Stratford-on-Avon
Provost, John Arthur	Mr. Chaston	Lowestoft
Saxby, Robert	Mr. Saxby	Lewes
Smith, Herbert George	Mr. Witherington	Worcester
Smith, Rawson	Mr. Davis	Harrogate
Ward, Joseph	Mr. Iliffe	Nuneaton
Watkins, Richard	Mr. Fowler	142, St. John St. Road
Williams, William Pyatt	Messrs. Williams & FitzHugh	Nottingham

SUBSCRIPTIONS TO THE JACOB BELL MEMORIAL—(*Continued*).

Amount previously advertised, £1829 17*s.* 6*d.*

	£	s.	d.
Henthorn, Joshua, Oldham	0	10	6
King, William, Soham	0	5	0
Maclagan, Douglas, M.D., F.R.S.E., President of the Royal College of Surgeons, Edinburgh	1	1	0
Randleson and Forster, Whitehaven	2	2	0

	£	s.	d.
Rayner and Son, Uxbridge	2	2	0
Sagar, Henry, Leeds	0	10	6
Seyde, John F., Willenhall	1	1	0
Slater, Thomas, Boston	0	10	0
Strawson, Henry, Crewkerne	1	1	0
Walkinton, William, Tenby	1	1	0
Williams, Walter, Hereford	1	1	0

PROVINCIAL TRANSACTIONS.

LIVERPOOL CHEMISTS' ASSOCIATION.

The Seventeenth Meeting of the Session was held in the Royal Institution, Colquitt Street, on May 24th,

THE PRESIDENT IN THE CHAIR.

Messrs. Weir, Johnson, Vickess, and Cross, were elected Members.

The Secretary announced the following donations to the Library and Museum:—*The Chemist and Druggist*, from the Proprietor. Two copies of Microscopic Drawings of Mustard Seed, from Mr. H. S. Evans. Three specimens of Opium; Opium Poppy Capsules; Scammony Shells; Salep; Mandrake Root; Valorica Mastic; Virgin Otto of Roses; Intischer or Oil, to mix with genuine otto, for the purpose of adulteration; Colocynth Apples; Indian Corn; Fresh Bulbs of Scilla maritima; Madder; Chio Turpentine; two fine specimens of Turkey Sponge, attached to rock, from H. S. Maltass, Esq., of Smyrna, through H. S. Evans, Esq.

The thanks of the meeting were passed by acclamation to the donors.

Mr. Mercer introduced to the meeting a new vermifuge from Abyssinia, and read a letter from Sir W. J. Hooker, who pronounced it to be the *Embelia robusta* of Roxburgh.

Mr. Weir exhibited and described two forms of self-acting Alkalimeters; one an improvement upon that of Mohr, and the other on the principle of a syphon. Full descriptions of these instruments, with cuts, will appear in a future number.

Royal Institution.

The Eighteenth Meeting of the Session was held on June 7th,

THE PRESIDENT IN THE CHAIR.

The following donations were announced:—Crosley's Improved Edition of Culpepper, from Mr. Whitthread. Four copies of the *Liverpool Flora*, with Supplements, from the author, Dr. Dickinson.

Mr. Abraham informed the meeting that a Club was in course of formation, to be called the "Liverpool Naturalists' Field Club," having for its object a more intimate acquaintance with every branch of Natural History, the eligibility of members not to be confined to those of the Chemists' Association, as before suggested.

Mr. Mercer delivered a second interesting lecture on "The Products of the Decomposition of Coal," detailing the various processes, and enumerating the valuable substances obtained, and their importance to the arts and sciences; also their commercial value.

A vote of thanks was passed to Mr. Mercer, and the meeting separated.

NEWCASTLE AND GATESHEAD BRANCH ASSOCIATION.

On the 7th of June, at the conclusion of the examinations of the Students, which had been delayed in consequence of the absence from town of the Lecturer on Chemistry, the prizes for general efficiency were awarded as follows:—

First Prize, to Mr. Thompson Temperley; Second Prize, to Mr. Thomas Barclay.

The papers of Mr. Elliott and Mr. Elwood deserved high commendation. The former gentleman laboured under serious disadvantage, from having been precluded from attending the Botanical Examination. The subjects included in the Examinations were Botany, Pharmacy, Chemistry, and Materia Medica.

MICROSCOPIC STRUCTURE OF PEPPER AND ITS ADULTERANTS.

The three following plates, representing the microscopic appearances of pepper and white and red mustard, have been engraved from drawings executed under the direction of Mr. George Phillips, Chemist to the Inland Revenue, and are referred to in the last number of this Journal, at page 605.

BLACK PEPPER.

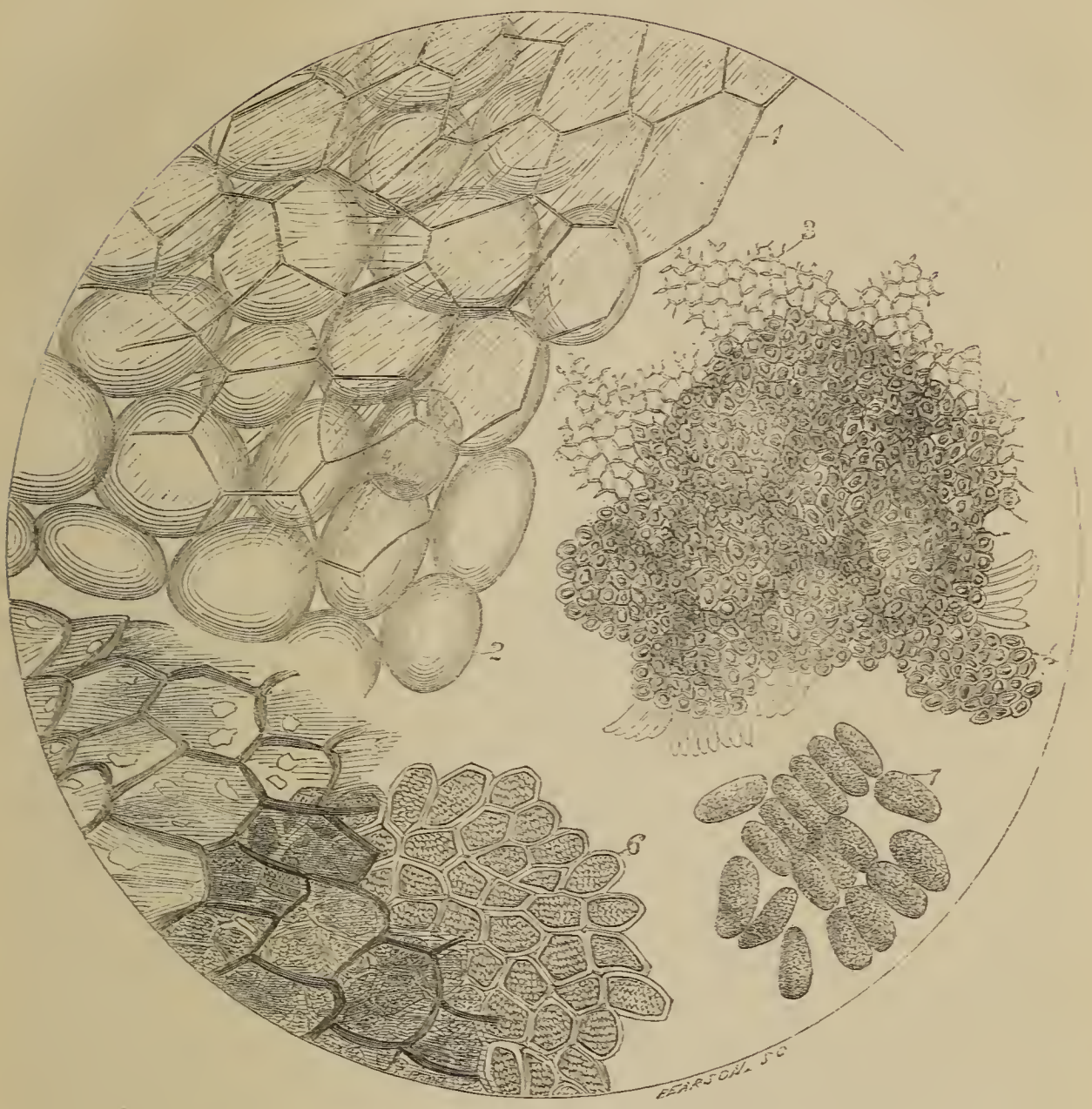
Taken from Drawings magnified 206 *Diameters.*

1. First Skin with Stomates.
2. Second Skin.
3. Third Skin.
4. Cellular Matter, immediately under third Skin.
5. Fifth Skin, showing spiral and fusiform Tissues.
6. Cells containing oil, which are immediately under fifth Skin.
7. Seventh Skin.
8. Eighth Skin.
9. Ninth Skin, next to the Starch Cells.
10. Starch Cells, with Starch Granules attached.

WHITE MUSTARD.

Taken from Drawings magnified 206 *Diameters.*

1. First Skin.
2. Second Skin.
3. Third Skin.
4. Fourth Skin.
5. Fifth Skin.
6. Mustard Cells.



RED MUSTARD.

Taken from Drawings magnified 206 *Diameters.*

1. First Skin.
2. Second Skin.
3. Third Skin.
4. Fourth Skin.
5. Fifth Skin.
6. Sixth Skin.
7. Mustard Cells.

ORIGINAL AND EXTRACTED ARTICLES.

CASSAVA BREAD, PREPARED FROM THE ROOT OF THE CASSAVA PLANT.

Janipha Manihot. (*Euphorbiaceæ.*)

BY MR. F. A. DAVSON.

There are two distinct varieties of the cassava plant—the bitter and the sweet. The root of the bitter cassava is large and tuberous, abounding in a milky juice. It can with difficulty be distinguished in appearance from the root of the sweet cassava; it does not, however, possess that tough, fibrous, and woody filament contained in the heart of the sweet cassava root. The sweet cassava root, although resembling that of the bitter in external appearance, unlike the latter, is not poisonous.

The plant of the sweet variety grows to about the altitude of four feet, the length of the root is about a foot, it is seven or eight inches in circumference, and of a lightish-brown hue.

The plant of the bitter cassava is generally six feet in height, the leaves are of a darker green, and the stem of a dark-brown colour. The roots require a somewhat longer period for coming to maturity, and are much larger, being about twenty inches in length, and ten in circumference. The sweet cassava is used throughout the colony of British Guiana as a vegetable, either boiled or roasted. When boiled and mashed with fish and meat, it makes excellent soup. From the farina of this root tapioca is prepared.

The bitter variety is cultivated to a great extent by the Indians. It is from this that they produce cassireepe and cassava bread, both of which appear indispensable to their subsistence. The details of the process for making cassava bread vary in different localities. In the British colonies, the root is first washed, then grated on a board stuck with small sharp-edged pebbles or fish bones, or a coarse tin grater is used for the purpose. The Brazilians use a hand-mill for grating the roots. The roots are thrown into the portion of the mill adapted for the purpose, the handle is turned, and the grated portion falls out of an aperture beneath, into a tub or other vessel placed below for its reception.

Edwards, in his *Voyage up the River Amazon*, talks about the roots being grated upon stones. The grated portion is then packed into a matapa, an elastic basket made of wild cane (from five to six feet in length, and three to four inches in diameter), each end terminating in a handle. When sufficiently packed, the upper handle is hung on a cross-beam of the banab (Indian hut), and through the other handle is fitted a heavy piece of timber, the end of which rests on the ground. The pressure on the timber, which is generally produced by sitting upon it, causes the milky fluid to flow out from the interstices of the matapa. This liquor, called "cassava water," is very poisonous, causing animals who drink it to swell to a great size, and die within a few hours. After depositing its starch, which it does quickly, it is boiled until it assumes a deepish brown colour, and is of the consistency of treacle. On being boiled, the poisonous qualities (hydrocyanic acid among them) are entirely dissipated, and the liquor is known under the name of cassireepe, which is said to enter into the composition of many of the English sauces. The Indians of Guiana mix a small portion with water, and boil with it a quantity of peppers, which renders it excessively hot; into this they dip their meat and cassava bread at meals. The colonists use the cassireepe for flavouring soups, in made dishes, and in making the far-famed "pepperpot," consisting of fish, meat, or fowl, or some of each, boiled with the cassireepe and peppers.

The residue in the matapa is spread out in flat cakes, upon round iron plates of different sizes, and baked over a wood fire. The bread should be perfectly white, not suffered to burn, and when obtained, kept perfectly dry in a tin box or canister. The more civilized inhabitants of the tropics (perhaps I should be better understood if I were to call them Europeans) are not satisfied with eating the cassava as obtained after baking, but have it toasted and buttered, which greatly improves the flavour, and gives it a pleasant crispness. The grated cassava bread is often used in preference to crumbed bread, for different purposes. The bread may be obtained from both plants; but, as a rule, that commonly used is prepared from the bitter cassava root, and the root of the sweet cassava is used in the production of tapioca. The cassava bread of the Indians is much thicker and sweeter than that prepared by the colonists. The cassava is propagated by cutting, growing to the altitudes already mentioned. Almost every leaf has one or more excrescences, about half an inch long.

Piawarri, an intoxicating liquor, is made by steeping cassava bread in water. The Indians, who are the only manufacturers, use a long narrow trough or boat, hollowed out of the trunk of a tree. In order to ferment this liquor, several old Indian squaws, almost toothless, assemble round the boat with a quantity of cassava bread, which they chew till well mixed with saliva, and spit out into the trough. In a day or two it is in a perfect state of ferment, and ready to drink. Piawarri is not commonly made as a beverage, but only on special occasions. When an Indian chief dies, he is buried in the village, and the other Indians quit the place immediately, leaving all their implements of chase and husbandry and food behind them. Twelve moons are allowed to pass over, when all the Indians of the chief's tribe assemble at the deserted village to feast and dance the "Macquarrie Whip-dance." Piawarri being prepared, a long banab is erected, in the middle of which the boat is placed with the intoxicating liquor. Each Indian marks his body over with roucou (*i. e.* arnatto) and lana dyes, and ornaments head, legs, and arms with the blue, red, and yellow feathers of the parrot and macaw. Each is provided with a whip about three feet long, the plaited thong of which is made from the silk grass, ornamented with small bunches of dried dyed grass; this is called the "Macquarrie whip." When sufficient numbers have assembled, and the sun has sunk behind the trees, the dance commences. They arrange in two opposite lines, as for a country dance. One commences, and after a few manœuvres, firmly plants one leg forward. The opposite Indian takes quick aim, and with his whip lashes the calf of the leg, frequently inflicting a deep cut; each Indian dances thus down the middle, presenting his leg to every Indian present for the lash. When excitement and howling are at its height, one leads off to the piawarri boat, and they dance in single file round and round, the women filling calabashes with piawarri, and presenting it to the men. The dance lasts sometimes for three days and nights. The evil spirit is supposed to be driven away from the chief's grave. The Indians return to their homes, and never again go back to the spot.

Having been some years absent from the colony, and having left at too early an age to take much interest in the produce of my birthplace, in a commercial point of view, I do not know whether cassava bread is imported commercially into this country. I am, however, inclined to suppose it is not, from never having met with it at all in England, nor heard of its exportation from the British colonies; and my familiarity with that tropical staff of life was only renewed last week, when a box of it was brought over for private consumption from my home in Berbice. The cakes were closely packed in a deal box, and covered up in brown paper; they arrived, after three weeks' voyage, perfectly white, in excellent condition, and in every respect equal, doubtless, to what is produced every day in the colony. A few years before I left the colony a few pounds of the dried sweet cassava root were sent over to England from Jamaica to ascertain whether it would prove profitable, if greater amounts were exported, as articles of com-

merce. Some of the specimens were perfectly white, in others, however, the worms had made some way in their repast before they arrived in England, and the greater number of samples were scorched and burnt by some accident or carelessness. This was hardly a way to procure custom. Had good specimens of the bread, as it should be prepared for the table, been sent over, the article undoubtedly would have met with a more welcome reception. It is not, however, too late to try the experiment again, the more especially as the specimen recently imported is everything that can be desired. The bread, being abundant, is cheap, and may be purchased at the rate of fourpence for a dozen cakes. It is also light, farinaceous, and pleasant to the taste, and altogether worthy of obtaining a high place among the luxuries of the English tea-table.

I have no doubt but that when emigration becomes more a matter of consideration in this country, and Europeans begin to believe that British Guiana is not such a seat of slavery and yellow fever as is commonly supposed, and when we gain the labour, which is all that is required, and when the produce of that territory is brought more before the British public than it has hitherto been, the colony will become a very important one; for there are many products of that fertile land, of which the European knows little or nothing; some he may know by name, and of others he has only seen small samples. No country on the surface of the globe can be compared with Guiana for its vigour and luxuriance of vegetation. There is a constant summer, and the rich soil, humid climate, and congenial temperature, insure an immense and rapid growth of vegetation, and a continued succession of leaves, flowers, and fruits. But I must not stray from the subject of the cassava to other products; for I should be led away to numbers indefinite, of which my faint recollection has but left me a limited knowledge. As I am, however, likely to return to the colony, I hope to be one of those who are doing their utmost to bring the products of the West before the public of this country.

NOTES ON CHINESE MATERIA MEDICA.

BY DANIEL HANBURY, F.L.S.

To draw up a general description of Chinese Materia Medica is a task that in the present state of our knowledge of the natural history of China, it were almost vain to attempt. Opportunities for scientific investigations in that vast country have as yet been far too limited, its zoology, botany, and mineralogy too little explored to enable any one to describe other than in a very imperfect manner even a small number of the varied products derived from the animal, vegetable, and mineral kingdoms, which come under the general denomination of *drugs*. But although sources of information are scanty, they are not entirely wanting; and I have, consequently, been led to think that under the simple title of *Notes*, it might be both useful and interesting to place upon the pages of a scientific journal such remarks upon Chinese Materia Medica as have been suggested by the examination of a considerable number of specimens which I have received through the kindness of friends in China. That, therefore, which I propose to do in the following pages is to give a short descriptive catalogue, firstly, of some of the mineral substances employed in Chinese medicine, which I have had the opportunity of examining, and of most of which I possess specimens; and, secondly, of a small number of animal and vegetable products, which may, from their origin, uses, or affinities, be of interest to the pharmacologist. The imperfectness of the information I have collected will, I trust, induce further researches on the part of those who

being residents in China have opportunities which I cannot command, but with whose labours I shall always be glad to co-operate.

Before commencing the task proposed, it is desirable briefly to review some sources of information upon Chinese Materia Medica, to which frequent reference will have to be made.

Of a considerable number of native works, the most important and well-known is, undoubtedly, the great herbal entitled *Pun-tsaou-kang-mŭh*,* written by Le-she-chin, in the middle of the sixteenth century. It was commenced in the reign and by command of the Emperor Kea-tsing, and completed by the son of the author in the reign of Wan-leih, to whom it was presented in the year 1596. For some centuries previous to this period, works of the same character had appeared at intervals, some of them published by authority of the government, and others by private individuals. Of a few of these works, Du Halde has preserved slight notices, to which I would refer the reader who is desirous of further information.† According to this author, the Pun-tsaou of Le-she-chin was written with the design of obviating the difficulties and confusion arising from a multitude of authorities, by supplying in one work a compendium of all that was more valuable in its predecessors. This design it probably fulfils, as it is held in high estimation by the Chinese and is frequently reprinted; but, excepting a revision and enlargement which it underwent in the fourteenth year of the Emperor Shun-chi, A.D. 1657, no attempt appears to have been made for the verification of old, or the acquisition of new, information. The Pun-tsaou is divided into 52 chapters, usually bound into about 40 thin octavo volumes, the first three of which contain woodcuts of many of the minerals, plants, and animals referred to in the text. These woodcuts, four of which occur on a page, amount in number to more than 1100: the name is placed above each, and sometimes a synonym at the side. No general translation of the Pun-tsaou into any European language has been published, though small portions of the work to illustrate particular subjects have frequently been translated. These extracts show that among much that is interesting, there is a large admixture of the absurd and fabulous, so that it is questionable whether the labour of translating so voluminous a work in its integrity would be repaid by the value of the information to be acquired. It is much to be desired, however, that a list of the woodcuts should be drawn up and printed, together with the Latin names of such minerals, plants, or animals as can be identified: such a list would form a convenient key to the Pun-tsaou, and although but a comparatively small number of the names might at first be determined, a basis would be laid for future labours.

To give some idea of the subjects treated in the Pun-tsaou, and the manner in which they are arranged, I have drawn up the following synoptical table of its contents, which Professor Stanislas Julien of Paris has favoured me by examining and correcting.‡

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* Like other Chinese names, it is written by Europeans in various manners, as, *Pen thsao kang mo*, *Pen tsao cang mou*, &c.

† *Description de l'Empire de la Chine*, Paris, 1735, fol. Tome iii., p. 441.

‡ I may also here acknowledge the information I have derived from Du Halde (*Op. cit.* iii., 437-9), as well as from Mr. S. Wells Williams, in the comprehensive account of the Pun-tsaou given in his *Middle Kingdom*, vol. i., chap. vi. I have also to thank my friends Messrs. Lockhart and W. G. Stronach, who have kindly determined for me many points involving a knowledge of the Chinese language.

SYNOPSIS OF THE CONTENTS OF THE CHINESE HERBAL

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39.	ANIMAL ..... 1st Division, INSECTS	§ 1.	Insects born from eggs	830— 859
40.	.....	2.		
41.	.....	3.	Insects produced by metamorphosis	860— 874
42.	.....	4.	Aquatic Insects [including frogs]	875— 886
43.	——— 2nd Division, SCALY ANIMALS	§ 1.	Dragons	887— 893
		2.	Serpents	894— 902
44.	.....	3.	Fishes having scales	903— 932
		4.	——— no scales	933— 953
45.	——— 3rd Division, SHELLY ANIMALS,	§ 1.	Tortoises	954— 962
46.	.....	2.	Mollusks	963— 985
47.	——— 4th Division, BIRDS	§ 1.	Aquatic Birds	986—1007
48.	.....	2.	Birds living upon open lands	1008—1026
49.	.....	3.	——— in woods	1027—1042
		4.	Mountain Birds	1043—1052
50.	——— 5th Division, HAIRY ANIMALS	§ 1.	Domestic Quadrupeds	1053—1064
51.	.....	2.	Wild Animals	1065—1094
		3.	Rodent Animals	1095—1104
		4.	Monkeys	1105—1110
52.	——— 6th Division, MAN [parts of the human body and human secretions and excretions employed in medicine.]			

* This series of numbers does not exist in the original. When added in MS. it affords a convenient and ready means of reference to any particular figure.

With regard to European works touching upon Chinese Materia Medica, the first to be mentioned is one entitled *Specimen Medicinæ Sinicæ*, published in 4to, at Frankfort, in 1682. This work, which was edited by Andrew Cleyer, a physician and botanist in the service of the Dutch East India Company, is a collection of Latin treatises, some of them being translations from the Chinese. A list of these treatises (not, however, agreeing with the titles of the treatises themselves) is placed on the title-page. The author or translator of most, if not of all, of these works, was not Cleyer, but Michael Boym, a Polish Jesuit missionary, who went to China and India in 1643. After Boym's death in 1656, his MSS. were sent to Europe, where those constituting the work in question were published in 1682. Owing, however, to disagreements between the Dutch East India Company and the Jesuit missionaries, the name of Boym was suppressed, and the work appeared as edited by Dr. Cleyer, first physician to the Company. The treatises comprised in the *Specimen Medicinæ Sinicæ*, relate chiefly to medical subjects, and especially to the Chinese doctrine of the pulse. One section, however, of 30 pages, attributed to Boym, is entitled, *Medicamenta simplicia quæ a Chinensibus ad usum medicum adhibentur*. It is an unclassified catalogue of 289 drugs, giving of each the Chinese name written after the Portuguese orthography, but without the Chinese characters; to this succeeds a brief description, chiefly as regards medicinal properties, which are expressed according to Chinese ideas. Occasionally the author is able to add the European name.

Incomparably more important and useful than Cleyer's *Specimen* is a little work published at St. Petersburg in 1856, for a copy of which I am indebted to the kindness of Professor Horaninow. It is entitled *Catalogus Medicamentorum Sinensium quæ Pekini comparanda et determinanda curavit Alexander Tatarinov, Doctor Medicinæ, Medicus Missionis Rossicæ Pekinensis spatio annorum* 1840—1850. (Petropoli, 1856. 8vo.) It is, as its title implies, the catalogue of a collection of Chinese drugs obtained in Pekin by Dr. Tatarinov, physician to the Russian mission in that capital, which drugs, as we learn from the preface, were subsequently examined and for the most part determined by Dr. Paul Horaninow, professor of Materia Medica at St. Petersburg. With the exception of the title-page and preface, which are in type, the catalogue is in lithograph, and forms a thin octavo of 65 pages. The Chinese characters for each name are given, and their sound expressed both in Russian and English writing characters. The arrangement is alphabetical, according to the names written after the Russian orthography. The name of each drug, so far as it could be determined, is given in Latin without note or comment. The catalogue includes the names of 500 substances.

Although these two are the only European works with which I am acquainted, that professedly treat of Chinese Materia Medica, there are some other valuable sources of information, which are too well known to require more than the briefest notice; such are the *Flora Cochinchinensis* of Loureiro, a work in which the medicinal properties of many plants of Southern China are briefly noticed. The *Amœnitates* of the German botanist Kæmpfer, published in 1712, contains an important section of 145 pages upon Japanese plants, for many of which the Chinese characters with their Japanese sounds are given. Nor should I omit to mention an Index of Plants of Japan and China, published in 1852 by MM. Hoffmann and Schultes,* in which the Latin names of about 600 species are enumerated, together with their equivalents in Japanese and Chinese, the Chinese characters being given.

With regard to inorganic Materia Medica, some information as to the Chinese designations of various mineral substances may be gathered from Keferstein's *Mineralogia Polyglotta* (Halle, 1849, 8vo, pp. 248); the Chinese words, however, are expressed only in Roman characters.

(*To be continued.*)

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* *Journal Asiatique*, Oct., Nov., 1852.

OBSERVATIONS UPON SOME OF THE PHARMACOPŒIA DECOCTIONS.

BY MR. A. F. HASELDEN.

The decoctions of the Pharmacopœia do not appear to have created at any time an interest at all in proportion to that displayed on many occasions towards their near relatives, the infusions, and this may probably be due to the influence of two causes; in the first place, under the supposition that a fire is available, the decoctions can in most cases be quickly made, and in the second, many of them are not exhibited internally by the mouth, and therefore, the palate not being concerned in the matter, the stimulus for producing an agreeable and sightly preparation does not exist to the same extent as with the infusions; and of those decoctions intended for internal use, a few of them only are in anything like constant demand. Now, upon these, as old acquaintances, I desire to offer a few brief remarks. The slight wavering which I had previously felt being cleared away by a reply to a correspondent, which appeared in the last number of this Journal, upon the subject in question, and which convinced me that doubts did exist amongst pharmaceutists respecting some of the decoctions, and that the directions for preparing them did, in a few instances, admit of some fresh arrangement.

With many of the decoctions, both for internal and external use, though the least frequently employed, viz., liverwort, winter green, pomegranate, tormentil, and elm, the directions given are plain and definite. A certain quantity of water is to be employed, to be boiled away until reduced to a given quantity, and then strained; and whether the fire be fierce or slack, the vessel in which the decoction is prepared large or small, the product, in quantity at least, will be made the same; and in the hands of an ordinarily careful workman, will generally approach uniformity. If we now turn to the directions given for preparing those which are perhaps the most important, namely, the decoctions of the different cinchona barks, it will be found that to a given weight of bruised bark, a certain quantity of water is to be added, and then cooked or boiled for fifteen minutes, according to the Pharmacopœia of 1836, in a vessel lightly covered, that is, leaving the lid partially off, thus allowing the steam to pass off, and affording a way of observing how the cooking is proceeding; whilst in the Pharmacopœia of 1851 it is to be boiled (according to the translators) in a closed or shut vessel —but for ten minutes only—and strained while hot; should it boil up suddenly, the lid will probably be forced partly off, and a portion of the contents wasted. Should it not reach the boiling point, it can only be said to have been digested. I cannot but regard the process and direction as unfavourable for producing anything like uniformity in a preparation so frequently employed and so essentially useful; and though the veriest tyro in pharmacy would scarcely be guilty of making a pint of decoction in a gallon saucepan, any more than he would brew a glass of grog in a punch bowl, still it is within the bounds of probability to believe that a pint of decoction might very often be prepared in a vessel unnecessarily large, whilst a gallon is arranged in one proportionately small. The difference in the waste of the fluid would be very much greater in proportion in the small quantity than in the large, and thus another possible source of want of uniformity. Now I would not propose, as directed by the Edinburgh College, that the decoction should be filtered, because that process appears to me simply a waste of labour and filtering material, if it should be decided by those best qualified to judge, namely, the profession, that the portion which is deposited on cooling should not be taken, the clear liquor may, after a short time, be poured off without difficulty; but I would suggest that after being gently boiled in an open vessel, stirring occasionally for ten or fifteen minutes, the decoction should then be strained, and increased by the addition of water, or reduced by evaporation, by means of moderate heat, as the case might be, to a given definite quantity, and the deposit which follows on cooling should, I

think, be shaken up and used, otherwise a preparation made by percolation with cold water, would in all probability answer the purpose of the decoction.

Again, in preparing the compound decoction of sarsaparilla, it is directed that to four pints of boiling simple decoction, so much sassafras, guaiacum, liquorice, and mezereon are to be added, and then boiled for fifteen minutes. The product from this must of necessity frequently vary; it will measure neither three nor four pints, and the pharmaceutist who adheres strictly to the directions laid down in the Pharmacopœia in preparing a pint or a gallon of fresh compound decoction of sarsaparilla, must make a calculation for the deficiency caused by the fifteen minutes' boiling, and use ingredients in a proportionate quantity. Any irregularity arising from this mode of proceeding might readily be avoided, either by bringing the decoction to a given quantity when finished, or by adding the ingredients to form the compound fifteen minutes before it was supposed the simple decoction would be boiled away to the required quantity, or—and which I believe would be an improvement—having made an aqueous extract of the sassafras, guaiacum, liquorice, and mezereon, to be kept in stock, and having calculated the product, let an equivalent of this extract be added to each pint of decoction, a more uniform preparation, less variable, and more conveniently made, would result from this mode of proceeding. A few words upon the decoction of poppy, and I will trespass no further. Here the system of time, without reference to the quantity of the product, is again followed. It may be urged by some that the quantity of the poppy is of no moment; moist heat is what is really required in nine cases out of ten. If this mode of reasoning is to be listened to, it would be, perhaps, better to expunge the preparation altogether. Would it not be wiser to employ the extract of poppy dissolved in boiling water? In making these observations, I shall not, I trust, be considered as hypercritical, for in a work intended for the guidance of every one connected with medicine and pharmacy in Great Britain, it may not be too much to hope and look for a work in future free from every discrepancy, and it behoves each one interested in the matter, to point out, whilst there is yet time and opportunity, anything that may appear worthy of consideration, or admitting of improvement.

18, *Conduit Street*, 11*th June*, 1860.

ON THE DROP AND MINIM MEASURE.

BY MR. BARNARD S. PROCTOR.

What is meant by "gtt."?

This is a question which the dispenser must often ask himself, and find difficulty in deciding upon any fixed answer which will serve all occasions, or in deciding upon any rule which will guide him as to which of two or three meanings he should attach to the term as various occasions arise.

It has been more than once pointed out that a drop varies much in size according to the form and size of the vessel from which it falls—also that it varies according to the density and viscosity of the fluid, and according to some other of its qualities not yet well understood.

There can be no doubt that it would be much better on the part of the prescriber to do away with the term "gtt." altogether; but while it is used, sometimes to express a minim, sometimes two-thirds of a minim, and sometimes a drop, without any definite idea of its value, it remains with us to decide, as best we can, how much tincture of digitalis or hydrocyanic acid is to be used in obedience to the physician's order of "gtt. xij." If all were agreed, it would probably be best to understand minims when guttæ are prescribed, which uniformity of practice might probably be obtained by adding a note to the table of measures in the Pharmacopœia, to the effect that minims shall, for the future,

take the place of drops; and this would probably also expedite the disuse of the ambiguous term by the profession.

There are, however, certain circumstances under which quantity may be advantageously estimated by drops. If a few minims of a powerful tincture are ordered in a draught, the minim meter is at once convenient and accurate; but if a few minims of oil are to be added to a pill mass, the case is otherwise—the proportion adhering to the measure being large and difficult of removal.

With the view of facilitating accuracy in such-like cases, I have ascertained the number of drops equal to f3j. of various essential oils, &c., when dropped from the bottles in which they are respectively kept, and have marked these numbers permanently upon the bottles, thus—Ol. Menth. P., 110; Ol. Caryophyl, 90; so that if mxij. of either of these are prescribed, twenty-two drops of the former or eighteen of the latter may be used. It is not necessary to trouble about the comparative fluidity of the various liquids, or the thickness of the bottle lip; but it is necessary to see that the dropping is always performed in the same manner: fifty-four drops of hydrocyanic acid equalled f3j., when each drop fell clearly from the lip of the phial; but if the stopper were not entirely removed, and the drop fell conjointly from the stopper and lip of the phial, thirty-two drops filled the same measure.

I subjoin a few of the numbers thus in use:—

Ol. Tiglii.,	100	drops	=	f3j.	Tr. Digital.,	96	drops	=	f3j.
" Lavand. Aug.,	120	"	"	"	Tr. Opii,	108	"	"	"
" " Exot.,	95	"	"	"	Creasote,	110	"	"	"
" Carui.,	98	"	"	"	Acid Hydrochl.,	45	"	"	"
" Menth. P.,	110	"	"	"	" Nitr.,	72	"	"	"
" Caryophyl,	90	"	"	"	" Hydrochl. Dil.,	65	"	"	"
Otto Rosæ,	150	"	"	"	" Hydrocyan.,	54	"	"	"
Chloroform,	250	"	"	"					

Dr. Pereira says of chloroform:—"The dose internally may be from five to twenty minims, or more. The physicians of the United States have been in the habit of prescribing it in much larger doses;"* and quotes several cases in which from 75 to 100 *drops* were given. Probably these doses were not greater than those of his own prescribing.

A reference to the table will also show the difference between selling otto of roses by the drop and by the drachm in a stronger light than some of your readers may have hitherto seen it.

There might be other points of interest considered in connexion with this table, but I will not add more, save a word of caution against any one adopting the numbers above given without direct experiment in each case.

Newcastle.

REPORT OF THE
RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION,
AND OF THE
APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

On the Conversion of Cane Sugar into Glucose by Fermentation.—M. Berthelot has communicated to the French Academy the results of a very important investigation, which appears to clear up a great deal of the uncertainty hitherto attending our knowledge of the action by which the yeast granule effects the conversion of cane sugar, first into glucose, and ultimately into alcohol. The following is the abstract of M. Berthelot's communication:—

Among the alterations which cane sugar undergoes, when submitted to the influence of the yeast of beer, one of the most remarkable is its conversion into interverted sugar. The researches of M. Dubrunfaut, some thirty years ago, proved that cane sugar treated with yeast is transformed into an uncrystallizable sugar, and M.

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* *Materia Medica*, vol. ii., part ii., page 512.

Persoz has shown that the rotatory power of this sugar is the reverse of the primitive one: hence the name *interverted* sugar. What is the precise character of this phenomenon of inversion? Is it due to a special action of the yeast, rendered necessary because the cane sugar is not directly fermentible? Or does the inversion of cane sugar result from some secondary influence, of a chemical order, and independent of the direct action of the ferment? All these points are involved in uncertainty. The following are M. Pasteur's words upon this subject, in his recent work upon alcoholic fermentation:—

"All that has been written on this subject is wanting of solid proof. For myself, I think that the formation of 'interverted' sugar depends entirely upon the constant production of succinic acid, which is only an accessory phenomenon..... In other terms, I do not think that the globules of yeast have any particular power of transforming cane sugar into 'interverted' sugar. But the succinic acid being a constant product of alcoholic fermentation, the sugar should experience in its presence the effects generally resulting from the action of acids."

Being under the necessity of reviewing the principal phenomena of fermentation, I have been led to enter upon the study of the preceding questions. They are not without interest, for they lead to the knowledge of whether yeast produces several successive effects upon the cane sugar, or if it produces only one; if it represents several ferments capable of inducing different results; and lastly, if several of the effects which it produces are the same as those which dilute acids are capable of developing by their contact.

The experiments which I have made are of three classes. In one I have sought whether succinic acid, employed under the same conditions as during fermentation, really possesses the power of interverting cane sugar. In the second, I have effected alcoholic fermentation maintaining the liquor alkaline, thus excluding all action due to the influence of an acid. These experiments having proved that the inversive action is really due to the yeast, I have been led to isolate the ferment which produces the inversion of cane sugar, and have studied its action separately.

Comparative Influence of Yeast and of Succinic Acid upon Cane Sugar.—200 grammes of sugar-candy were dissolved in such a quantity of water, that the resulting liquid measured 1000 cubic centimetres. This liquid deviated the "*teinte de passage*" +29.2 in a tube of 200 millimetres. The solution was divided into two equal parts: to the one was added 0.8 gramme of succinic acid, a larger proportion than would be produced by the end of an alcoholic fermentation of the same quantity of sugar; to the other portion was added 10 grammes of strained beer yeast. At the end of sixteen hours, the temperature remaining between 15° and 20° C., the solution containing the yeast was in full fermentation. It abundantly reduced the potassio-tartrate of copper; it was interverted, and deviated the "*teinte de passage*"—9° (to the left). On the contrary, the solution having the succinic acid did not sensibly reduce the oxide of copper; it deviated +28.9 (to the right). The difference between these two results admits of no doubt. It is not then to succinic acid that should be attributed the inversion accompanying the action of yeast. This result is more decisively arrived at by entirely avoiding the influence of the succinic acid, as follows:—

Inversion of Cane Sugar by Yeast in an Alkaline Liquid.—200 grammes of sugar-candy and 20 grammes of bicarbonate of soda were entirely dissolved in cold water, and the resulting solution made up to one litre. The deviation was found to be the same as in the former case, +29.2. To this liquid 20 grammes of well strained yeast were added, and the whole allowed to remain at a temperature between 15° and 20° C. The alcoholic fermentation developed itself, but not so energetically as in the preceding instance. At the expiration of sixteen hours the deviation had fallen to +9°, and the liquor plentifully reduced potassio-tartrate of copper. After forty hours, the alcoholic fermentation was progressing without the liquid losing its alkalinity; the sugar was interverted, and the deviation equal to —7°. The day after it rose to —8°; the liquid remained alkaline. One half, on being distilled, furnished seven grammes of alcohol. The remainder continued to undergo fermentation. These facts prove that yeast interverts cane sugar, by virtue of an action quite independent of the acidity of the liquors. The question arises, whether this inversive action is inherent to the yeast itself, or whether it resides in one of the principles contained in this vegetable.

Glucosic Ferment.—My first object was to ascertain what action the soluble portions of yeast are capable of exerting on sugar. Some well drained yeast was

macerated for several hours in twice its weight of water, and the liquid filtered. The resulting liquor contained 1.5 per cent. of soluble matter. When added to its volume of a solution of sugar, containing $\frac{1}{50}$ of bicarbonate of soda, it produced intervertion like yeast itself, and without rendering the liquid acid. Its action was very rapidly manifested by means of the potassio-tartrate of copper. Under these circumstances the sugar is interverted, without giving rise to alcoholic fermentation, or to the immediate development of organized beings.

The extract of yeast, then, contains a peculiar ferment, soluble in water, and capable of converting cane sugar into "interverted" sugar.

This ferment may be obtained in a more isolated condition, by mixing the cold aqueous infusion of yeast with its own volume of alcohol. A white flocculent precipitate is formed, which collects at the bottom of the vessel. When washed with alcohol and dried at the ordinary temperature, this precipitate forms a yellowish horny mass, the weight of which represents about one-fifth of the soluble matters contained in the aqueous extract. This substance consists of a particular nitrogenous principle, comparable to diastase and to pancreatin, coagulable by heat and by nitric acid. When isolated, it can be redissolved in water, reprecipitated by alcohol, &c.; but this treatment weakens its specific activity. In its primitive state, one part is sufficient to intervert from 50 to 100 parts of cane sugar.

Lastly, this ferment is reproduced at the expense of the yeast, and constitutes one of its secretions. In fact, yeast which has been washed with water, until perfectly exhausted and all soluble matter removed, if allowed to digest with a small quantity of water for some time furnishes a fresh portion of glucosic ferment. This explains why washed yeast is capable of interverting sugar.

These facts now detailed throw a new light upon the nature of yeast, and upon those phenomena to which it gives rise. They prove that yeast does not consist of one definite ferment. We know that the researches of M. Cagniard de Latour and also of M. Pasteur have established yeast to be a mycodermic vegetable. From the results of my experiments, I think that this plant does not act upon the sugar by virtue of any physiological influence, but simply by the ferments which it has the power of secreting, in the same manner as germinated grain secretes diastase, the almond secretes emulsin, the pancreas of an animal secretes pancreatine, and the stomach of the same animal secretes pepsine. Among these secreted ferments, those which are soluble can be isolated and purified up to a certain point as immediate definite principles. I have shown that this is the case with the glucosic ferment, one of those contained in the yeast of beer. On the contrary, the insoluble ferments remain involved in the organized tissues, and cannot be separated.

In short, in the cases enumerated above and which relate to soluble ferments, we see clearly that the living being is not the ferment, but that it generates the ferment. When these ferments have been once produced, they exercise their action independent of all ulterior vital action; this action presents no necessary relation with any physiological phenomenon. I insist upon these words in order that no doubt may exist upon the manner in which I view the action of these soluble ferments. It is also evident that each of these ferments may be formed by preference, if not exclusively, by particular vegetables or animals: each organized being producing and multiplying the ferment corresponding to it, in the same manner that it produces and multiplies all the other immediate definite principles of which it is constituted. Hence the success of the very important experiments of M. Pasteur on the sowing of ferments, or rather, according to my view, of the organized beings which secrete the veritable ferments. If a more profound study should lead to the extension of the view I have proposed, and should verify its application to the insoluble ferments, all the fermentations might be comprehended under one view and definitely assimilated to actions induced by contact with acids and true chemical agents.

On the Fermentation of Mucic Acid.—M. Rigault has presented to the French Academy a note of some experiments undertaken by him with a view of tracing out, if possible, more intimately the analogy which evidently subsists between citric acid and mucic acid. These two bodies have a composition almost identical, mucic acid containing the same elements as citric acid crystallized with two atoms of water.*

* Liebig's formula for citric acid. Mucic acid.

$$\overbrace{3\,HO,\,C_{12}H_5O_{11},\,2\,Aq.} \;=\; \overbrace{2\,HO,\,C_{12}H_8O_{14}.}$$

Moreover, when submitted to the action of fused potash, they both split up into one atom of oxalic acid and two atoms of acetic acid, which seems to indicate that not only are their elements the same, but that they have a similar arrangement. Starting from this point of view, M. Rigault conceived that it would be interesting to submit these acids to the action of ferments, which, from giving rise to slow and gradual transformations, would be better suited to indicate the relationship existing between the two organic molecules. We are already acquainted with the action of ferments upon citric acid. M. Personne has shown that they convert citrate of lime into acetate and butyrate of lime. M. Rigault wished to ascertain whether mucate of lime would react in a similar manner. He made comparative experiments with a number of ferments, but he found that muscular tissue was the most rapid and regular in its action.

200 grammes of mucate of lime were diffused through 1½ litres of water and 15 grammes of the muscular tissue of a fowl's gizzard added, together with 50 grammes of carbonate of lime. The whole was contained in a flask, fitted with a bent tube dipping beneath the surface of the water. The temperature was maintained at from 25° to 35° Cent. A disengagement of gas took place during the fermentation, and the suspended mucate of lime gradually disappeared, an odour being evolved analogous to that of the lactic acid fermentation. The gas consisted of carbonic acid, containing a variable proportion of hydrogen.

At the conclusion of the fermentation, the liquid was evaporated, the residue treated with sulphuric acid, and distilled, when a mixture of acetic and butyric acids was obtained; the latter, however, was in small proportion. The formation of these bodies may be represented by the following equation:—

$$3\ (C_{12}H_{10}O_{16}) = 3\ (C_4H_4O_4) + (C_8H_8O_4) + 16\ Co_2 + 10\ H.$$

But the author considers that the production of butyric is only due to a subsidiary action, and that the principal change is as follows:—

$$2\ (C_{12}H_{10}O_{16}) = 4\ (C_4H_4O_4) + 8\ Co_2 + 2\ H.$$

These experiments of M. Rigault, therefore, present further evidence of the close analogy which mucic acid bears to citric acid; a relation which becomes the more curious and interesting when we remember the means by which mucic acid is obtained—namely, by the oxidation of gum or sugar of milk with nitric acid—and that M. Liebig has so recently shown that during the same process *tartaric acid* is produced. These facts almost lead to the hope that some day these two most important vegetable acids (citric and tartaric) may be both produced by artificial means, and by similar processes.

A Means of Detecting Bisulphide of Carbon in Coal Gas.—Bisulphide of carbon is constantly present in varying proportions in ordinary purified coal gas, and constitutes the source of the sulphurous acid formed during the combustion of gas. Dr. Hofmann has recently indicated an elegant and delicate method of detecting this substance by means of *triethylphosphine*, which produces with the bisulphide a compound crystallizing in splendid prisms of a ruby colour. Four or five drops of the triethylphosphine are dissolved in ether, the ethereal solution introduced into a bulb apparatus, and a current of coal gas allowed to bubble through. The liquid first assumes a red colour, and before a cubic foot of gas has passed the whole of the ether has evaporated, and the inner surface of the bulbs is lined with a beautiful network of the ruby crystals.

ON THE PROXIMATE ANALYSIS OF PLANTS AND VEGETABLE SUBSTANCES.

BY FREDERICK ROCHLEDER, M.D.

(*Continued from page* 614.)

Further Investigation of the Seven different Solutions, and the Distillate obtained from the Aqueous Decoction.

Section I.—*Examination of the aqueous decoction and the distillate therewith obtained.*

A.—Examination of the distillate.

The watery distillate, which is obtained by the decoction of the material with water according to the previous directions, is either a clear or a turbid fluid. It has either a film of oil floating on the surface, or precipitated at the bottom or not. If the

distillate is a clear fluid, it contains either only a very little quantity of substances soluble in water, or none of these substances. If the water is turbid from the separated oil globules or solid particles, it contains little of substances difficultly soluble in water, or much of readily soluble ones. The water is first, when a layer of oil has collected at the top or bottom, mechanically separated from the oil. After the principal bulk of the water has been removed by a syphon, its complete removal is effected by means of a separatory funnel or a pipette. The water is then treated precisely as when no layer has been deposited on the surface or at the bottom. This method of treatment is described at length further on.

a.—Examination of the separated oil.

It is first ascertained whether the separated oil reacts on litmus paper or not. If the blue litmus paper is reddened thereby, the oil is either a volatile acid or a mixture of several volatile acids, or lastly a mixture of one or several volatile acids with other volatile bodies. It is scarcely necessary to remark that, besides the peculiar volatile acids, some aldehydes also may be present; for example, salicylous acid as well as the acid ethers of bibasic acids—as, for instance, the acid salicylate of methyloxide, which is obtained by the distillation of gaultheria procumbens, and which behave in this and other respects as volatile acids.

If the oil has an acid reaction, the oil is introduced into a flask, and baryta water added thereto with agitation. This addition is continued until it has no longer an acid reaction; afterwards it is allowed to precipitate quietly. Either the oil has quite disappeared by this treatment with baryta water—if so it was a volatile acid, or a mixture of several such acids, or an acid aldehyde resembling the salicylous acid, or an acid ether, possibly a mixture of several aldehydes or ethers, or a mixture of several members of these two classes of bodies, or of all three.

The oil which remains after the treatment with baryta water is neutral or *alkaline*. In the latter case it is treated with dilute sulphuric acid. When a volatile base is present therein, it dissolves in the dilute sulphuric acid. If absent, as much oil is dissolved as would be dissolved in an equal quantity of pure water. If the first separated oil has exhibited an alkaline reaction instead of an acid one, it is likewise treated with dilute sulphuric acid. Either a complete solution of the oil takes place, in this case an organic volatile base, or a mixture of several such bases is present, or a partial solution is effected when it is a mixture of one or more volatile bases with non-basic bodies.

As we learn by this experiment whether bases or acids are at the same time present, or bodies which behave as acids towards bases, and in case such bodies were found they have been removed by the treatment with sulphuric acid and baryta water, we now proceed to detect the presence of the aldehydes. If neither an acid nor a base is present, the oil can at once be used for testing for aldehydes. With this object, a portion of the oil is mixed with a solution of the bisulphite of potash as concentrated as possible. When an aldehyde is present, it is generally taken up by the solution of bisulphite of potash. Either a portion of the oil, or the whole of it, is dissolved, depending on the presence of indifferent bodies, besides one or more aldehydes. It should be observed, by the solution when it takes place, whether a more or less elevation of temperature results, caused by heat becoming free, in consequence of the combination of the aldehyde or aldehydes, with the bisulphite of potash. When no reaction is produced at ordinary temperatures, this can be effected by heat. Sometimes after the solution of the oil, or a portion of it, in the concentrated aqueous solution of the bisulphite of potash, by long standing and cooling, a separation of crystals results. If no such separation is observed, the undissolved portion of the oil can be removed mechanically, and alcohol carefully added to the solution, by which the separation of the aldehydes or aldehyde in combination with the bisulphite of potash is facilitated. Sometimes the addition of bisulphite of potash quite or partly congeals the oil, in consequence of the formation of a compound of the aldehydeiwith bisulphite of potash. In this case the solid or semi-solid mass should be washed with alcohol, and the washed product pressed between bibulous paper. If neither before nor after the addition a solid compound of one or more aldehydes with bisulphite of potash results, the action of the corresponding soda-salt is tried, and when this affords no solid product, the corresponding ammoniacal bisulphite should be employed. If an aldehyde, or several of them together, are present, we obtain with the bisulphites of potash, soda, or am-

monia, a compound or a mixture of them, from which, by the addition of dilute sulphuric or hydrochloric acid, or a solution of caustic potash or soda, the aldehyde or aldehydes can be again separated.

In the same way as here described, the oil freed from acids by baryta water, and bases by dilute sulphuric acid, is treated to remove the aldehyde or aldehydes present.* If, after the separation of the bases and acids or aldehydes present, any oil remains, this portion may either be a hydrocarbon or a mixture of several such bodies, or an oxygenated indifferent oil, or a neutral compound ether, or a mixture of several of these bodies.

Whether we have to do with *a hydrocarbon or a mixture of several hydrocarbons*, or whether *an oxygenated volatile substance* is also present, a fragment of sodium or potassium is introduced into the oil, previously dried by means of chloride of calcium. If the metallic fragment remains untouched in the fluid by the application of a gentle heat, no oxygenated body exists in the oil; consequently the oil must be a hydrocarbon, or a mixture of several hydrocarbons. On the contrary, if the oil reacts on the potassium or sodium, an oxygenated body, or a mixture of several such bodies, is present.

To prove whether or not the oxygenated body present is *a compound ether*, the oil under examination is divided into two parts. One portion is treated with caustic ammonia in a small flask, by which, in many cases, an amide of the acid of the ether separates, while the alcohol corresponding to the ether becomes free. The second portion of the oil is introduced with baryta water into a small retort, a little of the crystals of hydrate of baryta thrown in, and the retort so connected with a small Liebig's refrigeratory apparatus that the condensed vapours are compelled to flow back again into the retort, when the contents of the retort are heated to the boiling point. When the ebullition has been continued for a long time, the refrigeratory apparatus is brought into its ordinary position, and the distillation proceeded with. The hydrocarbons present, as well as the indifferent oxygenated oils, pass over with the aqueous vapour; likewise the alcohols derived from the ethers. The acids of the ethers remain behind, combined with the baryta. The residue of the retort is, when cold, removed, and the baryta separated from the liquid, which, when necessary, should previously be filtered, by means of dilute sulphuric acid. After separating the sulphate of baryta by a filter, the liquid is again distilled, whereby the acid is obtained either in the distillate in which its presence may be easily detected, or when it is not distillable with water its concentrated solution remains behind in the retort. From this fluid the acid, under proper conditions, is crystallized out. The existence of compound ethers in the oil, separated from the distillate, is not very frequent, as the majority of ethers, being readily soluble in water, are found dissolved in the aqueous distillate.

If no compound ether is present, it is still to be determined whether *an oxygenated indifferent volatile oil* is admixed with hydrocarbons or not, which was partly discoverable from the treatment of the oil with potassium or sodium. To detect such body, the oil to be examined is introduced into a small retort, which is half filled with coarsely powdered soda-lime.† The oil is absorbed by the soda-lime. After a flask, as a receiver, has been adjusted, the retort is carefully heated. The hydrocarbons will be distilled over, unchanged in their composition, while the oxygenated oils will be decomposed by the action of the alkaline compound. Generally, non-volatile compounds result therefrom, which only are decomposed by higher temperatures, under the formation of volatile compounds. Gerhardt and Cahours, in this way, have separated the hydrocarbons from the oxygenated oils in many mixed oils. Frequently the oxygenated oils afford, by this treatment, coloured decomposition products. Thus the distillate of the oil of calamus over soda-lime is at first colour-

* I found, by the examination of oil of origanum, that it consisted of two volatile oils, which afforded, when heated with an aqueous solution of bisulphite of soda or ammonia, a solid body, but which contained no sulphur, soda, or ammonia. I have deemed it necessary to call attention to this circumstance, as it is highly probable that there are many other volatile oils which behave like oil of origanum. Consequently, if we would decide with certainty on the presence of an aldehyde, we must ascertain whether the product obtained by the action of alkaline bisulphites contains sulphurous acid, or the alkali employed in its preparation. If sulphurous acid and an alkali cannot be detected, no aldehyde is present.

† Soda-lime is made by mixing lime with a solution of caustic soda, in such proportion that, upon evaporation, the mixture, when heated to redness, shall be equivalent to one part of the hydrate of soda, with two parts of anhydrous lime.—EDITOR.

less so long as the lighter volatile oils distil over unaltered. Later, a blue distillate appears, arising from the decomposition of the heavier oxygenated volatile portion of the oil of calamus, by the alkali at a higher temperature.

We turn back to the aqueous solution of the baryta salt or salts, which was obtained by agitating the oil with baryta water, which oil had collected on the surface, or at the bottom of the watery distillation. This solution is divided into two parts. The first is introduced into a retort, into which a little hydrate of baryta is placed. The retort is connected with a refrigerator, and the greater part of the water is distilled off. If an acid ether was present this is decomposed. The corresponding alcohol is separated and is found in the distillate, and the acid in combination with the baryta is in the residue of the distillation. The second part of the solution is mixed with dilute sulphuric acid, as long as a precipitate of sulphate of baryta is formed. The sulphate of baryta is separated by filtration, and the filtrate distilled off until a small residue remains. As this fluid must contain a tolerably large quantity of volatile acid compounds, it may be ascertained whether an aldehyde of an acid character is present or not, by the addition of a highly concentrated solution of alkaline bisulphates, and a sufficiently large quantity of anhydrous alcohol. If this is not the case, then only a volatile acid, or a mixture of several such acids, is present.

It was previously mentioned that the oil separated from the distillate, when before or after treatment with baryta it reacted alkaline, should be shaken with dilute sulphuric acid that the base or bases present may be obtained dissolved as sulphates. The solution of sulphates is then mixed with baryta water as long as a precipitate of sulphate of baryta ensues; for certainty, one or two drops of baryta water is added in excess, and the liquid distilled from a retort which is connected with a refrigeratory apparatus, as long as the distillate has an alkaline reaction. The distillate is now exactly neutralized with dilute sulphuric acid and evaporated to dryness. The residue is treated with alcohol, which dissolves the sulphates of the bases. If a residue remains, either ammonia or methylamine is present, or a mixture of both, in the form of sulphates. After the expulsion of the alcohol from the alcoholic extract in the water-bath, the salts of the other bases perchance present remain behind. They may be easily obtained therefrom, by distillation with a solution of caustic potash, in an isolated form, or by mixing the salts with a solution of caustic potash and agitating with ether, by which an ethereal solution of the bases is obtained, from which the ether can be distilled off. If by the examination of the separated oil no bases, acids, or aldehydes have been found ; if no compound ethers are present, or if these bodies have been removed ; further, if the oxygenated indifferent volatile oils sometimes present have been separated from the hydrocarbons by distillation over soda-lime, in so far as this method is concerned we have still to ascertain *whether only a hydrocarbon, or a mixture of several hydrocarbons, is present.* To arrive at a conclusion on this point, the oil in question is distilled in a small retort in which a thermometer is inserted. A rapid continued rising of the boiling point proves that the oil is a mixture of several volatile substances.

It should be always observed whether a portion of the original oil as it floats on the watery distillate, or falls to the bottom of the same as a layer, cannot be congealed by exposure to very low temperatures, independently of its reactions and other properties. Frequently *a partial separation simply by exposure to cold* may be effected in substances of that kind, more readily in this than in any other way.

In winter the most convenient method is to stick a test tube containing the oil in a beaker glass filled with snow, and to stand the whole in a wooden vessel. The space between the glass and the wood vessel is filled with sawdust; the glass should stand on a layer of sawdust several inches high; into the glass alcohol is poured carefully, when the snow melts, and the mixture cools down to 130° Fahr. below zero. The whole is covered with a quire of filtering paper. As paper and sawdust are bad conductors of heat, the depressed temperature continues sufficiently long to congeal the oil or to cause the separation of solid substances from it when this can be accomplished by cold.

Besides the volatile bodies just under consideration which in the form of oils can be separated on the surface or at the bottom of the distillate, there exists still a class of bodies which in their composition are readily distinguished from those spoken of. These are the *essential oils containing sulphur*, as they are generally termed ; for example, oil of mustard, oil of onion, oil of asafœtida, oil of garlic, &c.

The presence of these oils is generally rendered evident by their odour. But to be certain as regards their absence or presence, a portion of the oil is oxidized with nitric acid, and then tested for sulphur. If sulphur is contained in the oil, it is converted into sulphuric acid by treatment with nitric acid, which can be detected by nitrate of baryta. The majority of these oils afford precipitates when dissolved in alcohol and mixed with a solution of chloride of platina or bichloride of mercury. By the application of chloride of platina the precipitates are either pure red, reddish-yellow, or reddish-brown; and by the use of bichloride of mercury, on the contrary, white sometimes, with a shade of yellow.

It still remains to be stated *how the alcoholic solutions of ethereal oils* must be treated, as obtained when an oil is treated with alkaline bisulphites, and thereby partly congealed, and the fluid portion remaining removed from the solid compound by washing with alcohol.

Such a spirituous solution is shaken with milk of lime, and in a closed vessel allowed to remain undisturbed until the insoluble portion is deposited at the bottom. The clear fluid is taken off and distilled, to the distillate is added a piece of anhydrous, but not fused, chloride of calcium, after it has been placed in a stoppered bottle surrounded with cold water. The chloride of calcium dissolves in the alcohol and water present, and the oil which was dissolved separates on the saline solution as a slight film, which can be removed by a pipette, washed with a little water, and obtained pure by rectification with water. As a strong bumping is unavoidable by boiling with a little water in the retort, I employ for this purpose a flask, and introduce with the water and the ethereal oil some large pieces of clean linen. This plan also prevents the spirting over in rapid distillation.

(*To be continued.*)

MEANS OF DETECTING THE ADULTERATION OF CHINESE RHUBARB WITH THE AID OF ESSENTIAL OILS.

BY EMILE RILLOT,
Pharmacien à Mutzig (Bas-Rhin).

Chinese rhubarb has at all times been sufficiently high in price to form a temptation to the cupidity of adulterators. M. Chevallier, in his *Treatise on Adulterations*, says that, in 1846, there was cultivated in the suburbs of Paris a species of rhubarb, which was sold as foreign to the pharmaciens in the country. This rhubarb could not well be sold to the public whole, for the fraud was too evident; but it is probable that it was powdered and then mixed in varying proportions with Chinese rhubarb. The mixture of powdered Rhapontic with Chinese rhubarb is difficult to discover, for the colour, odour, and taste of Rhapontic, although more feeble, are nevertheless very analogous to Chinese. The trials which I have made to detect this adulteration have produced some results, which will, I believe, be useful to my brethren, and enable them to discover even the smallest quantities of Rhapontic rhubarb mixed with Chinese rhubarb.

When the different varieties of rhubarb are treated with nitric acid, a peculiar coloration is produced, which M. Garot has designated by the name of *érythrose*. This coloration is yellow with the indigenous rhubarbs, and orange with the exotic kinds. The essential oils produce an inverse effect, that is to say, Rhapontic rhubarb produces a coloration which varies from orange to flesh colour, whilst Chinese rhubarb experiences no change of colour.

The following tables show the reactions obtained by means of different portions of Rhapontic rhubarb mixed with Chinese rhubarb.

When equal parts of Chinese rhubarb and magnesia are mixed together, a yellowish colour is produced; when this is diluted with a further quantity of magnesia, and some essence of aniseed added, this coloration remains the same; but when we take equal parts of Rhapontic rhubarb and carbonate of magnesia and add essence of aniseed, there is produced after a strong trituration for five minutes a reddish-orange salmon colour. By this means alone we can distinguish powdered Chinese rhubarb from that of Rhapontic; but my trials have been principally carried on upon the colouring action of mixtures of Rhapontic and Chinese rhubarb. The following is the order in which I have made these trials:—

No. 1.

Chinese Rhubarb	2 grammes.
Calcined or Carbonate of Magnesia	2 grammes.
Essence of Aniseed	20 drops.

After trituration for five minutes, we obtain but little difference of coloration.

No. 2.

Rhapontic Rhubarb	2 grammes.
Carbonate of Magnesia	2 grammes.
Essence of Aniseed	20 drops.

After a trituration for five minutes, we obtain an orange-salmon coloration; the powder attached to the pestle has the appearance of red lead (*minium*).

No. 3.

Rhapontic Rhubarb	2 grammes.
Calcined Magnesia	2 grammes.
Essence of Aniseed	20 drops.

After a trituration for five minutes, we obtain a very intense rose-salmon coloration.

No. 4.

Rhapontic Rhubarb	2 grammes.
Calcined Magnesia	2 grammes.
Carbonate of Magnesia	2 grammes.
Essence of Aniseed	20 drops.

After a trituration for five minutes, we obtain a lively rose-salmon colour, but the rose is more evident than that in No. 3.

No. 4 *bis*.

Rhapontic Rhubarb	50 centigrammes.
Chinese Rhubarb	50 centigrammes.
Calcined Magnesia	2 grammes.
Carbonate of Magnesia	2 grammes.
Essence of Aniseed	20 drops.

After a trituration for five minutes, we obtain a rose-flesh-salmon colour.

No. 5.

Rhapontic Rhubarb	30 centigrammes.
Chinese Rhubarb	70 centigrammes.
Calcined Magnesia	2 grammes.
Carbonate of Magnesia	2 grammes.
Essence of Aniseed	20 drops.

After a trituration for five minutes, we obtain again the same coloration as in No. 4 *bis*.

And whenever the quantity of powdered Rhapontic rhubarb is diminished, we constantly obtain a more or less deep rosy coloration. We can, by this means, discover the slightest trace of Rhapontic rhubarb; but it is necessary to observe, that it is much better to employ simultaneously the two kinds of magnesia, for the carbonate gives a coloration more yellowish-red, leaning to rose, whilst calcined magnesia produces a coloration more decidedly rose. The essential oils of bergamot, fennel, citron, &c., produce similar reactions. The essence of mint decolorizes, so to speak, at first (and only after a long trituration), the mixture of Chinese and Rhapontic rhubarbs; but the rose colour is soon restored; whilst with the Chinese rhubarb it produces only a dull grey colour.—*Journal de Chimie Médicale*, June, 1860.

ON THE MEASUREMENT OF THE CHEMICAL ACTION OF THE SOLAR RAYS.

BY PROFESSOR H. E. ROSCOE.

Those portions of the solar rays which vibrate most slowly, and are situated near the red end of the spectrum, are those which mainly regulate the alterations of temperature on the surface of our planet. They are, *par excellence*, the heating rays. They principally produce all those motions in our atmosphere which we term winds; they effect those grand phenomena of distillation and deposits which we call rains;

and the amount and distribution of those heating rays at any point on the earth's surface determines the thermal climate of that point.

On a scale, perhaps less grand, but certainly not less important as regards their effects, are the actions produced by the most rapidly vibrating portion of the sun's rays; those, namely, which are situated near the violet end of the spectrum. These rays have been called the chemical rays, because it is by these especially that the chemical action of the sunlight is effected. It is in presence of these rays alone that the plant is enabled to decompose the carbonic acid of the air, to assimilate the carbon, restoring the oxygen for the subsequent use of animals. Hence the amount and distribution of these rays at any given place regulates to a great extent the character of the fauna and flora; gives, in short, the "chemical climate" of the place.

The measurement of the quantity of this solar energy, falling at any time on a given spot upon the earth's surface, must be a subject of primary importance in the determination of the physical history of our globe. We fortunately possess a method, although it is only a comparative one, for measuring the amount of effect which the heating rays produce, that is for measuring *temperature*. No such mode of measurement for those of the solar rays which especially effect chemical action has, up to the present time, been adopted; not that meteorologists have ignored the importance of the subject, but because the difficulties which beset the establishment of a measuring instrument for chemical action were considered to be insurmountable.

The speaker remarked that his object was to bring before his audience the principles and mode of action of a method employed for the measurement of the chemical action of light.*

As an illustration of the chemical action of light, attention was directed to the fact, that when a perfectly pure mixture of exactly equal volumes of chlorine and hydrogen gases is exposed to light, the gases combine, producing an equal volume of hydrochloric acid gas, whilst no such combination occurs in the dark. This combination may occur gradually, or with great rapidity. If the chemical activity of the light be great, the union takes place quickly, great heat is evolved, a sudden expansion takes place, and the vessel containing the mixture of chlorine and hydrogen is shattered by the explosion. The gradual or slow combination may be rendered evident by allowing the hydrochloric acid thus formed to be absorbed by water; the consequent diminution of bulk of the gas accurately representing the chemical action effected.

This mixture of equal volumes of chlorine and hydrogen is used as the sensitive substance for measuring the chemical action of light. It is evolved in the perfectly pure state by the electrolytic decomposition of strong aqueous hydrochloric acid; and it is by this method only that it can be prepared. The gases thus evolved are in the exact proportion in which they exist in hydrochloric acid, so that, if by any means we re-combine these gases, no trace of either substance will remain behind, the whole uniting to form hydrochloric acid.

For the purpose of measuring this chemical action effected, not only by solar light, but also by light from many artificial sources, we require some instrument, which is to the chemical action of light what the thermometer is to the heat actions; an instrument which will show objectively the amount of chemically active light. We must be sure, in the first place, that our mode of measurement is a reliable one. That, as in the case of the thermometer, equal increments of volume correspond to equal increments of heat, so, in the new instrument, the indications, however obtained, shall be proportional to, and represent the amount of chemical rays emanating from, any source.

This has been accomplished in the chemical photometer; by the help of which an accurate measurement of the chemical action of light is effected.

The facts upon which this mode of measurement is based, may be summed up as follows:—

1. Exactly equal volumes of chlorine and hydrogen gases, when mixed, combine together on exposure to light, forming hydrochloric acid gas.

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* For a detailed description of apparatus, &c., see *Photochemical Researches*, Part 1, "Measurement of the Chemical Action of Light," by R. Bunsen and H. E. Roscoe.—*Phil. Trans.*, 1857, p. 355.

2. This combination does not occur in the dark.
3. The quantity of hydrochloric acid thus formed is directly proportional to the intensity of the incident light, and serves, therefore, as a measure of the chemical action produced.
4. The chemical photometer is an instrument, by help of which the quantity of hydrochloric acid thus formed, can be accurately measured.

The chemical photometer consists essentially of three parts; namely, first, the apparatus in which the sensitive gas in generated; secondly, the apparatus in which the gas is exposed to the light; and thirdly, the apparatus in which the volume of hydrochloric acid produced in a given time is read off.

When very numerous precautions in the management of the photometer are taken, it proves a most sensitive and reliable instrument. Having thus obtained an instrument by which the chemical action of light can be accurately measured, it only remains to graduate it. For this purpose we require a standard of light, from which the determination is to proceed. For this comparative measurement, the possession of a constant source of light is the first essential. This is obtained as follows:—

1. A flame of pure carbonic oxide gas, burning in the air and issuing from an opening of given size at a given rate, is employed as the *standard flame.*
2. *The unit amount of chemical action*, is that effected by such a flame upon the sensitive mixture of chlorine and hydrogen during one minute, at the distance of one metre.
3. The quantity of chemically active light producing this action is called *one chemical unit of light;* and ten thousand of such units *one chemical degree of light.*
4. The chemical photometer is graduated by observing how many of these chemical units of light correspond to one division on the scale of the instrument.

As an illustration of the mode in which this measurement of the chemical action of light is employed, the speaker described the method by which the chemical action produced by the direct solar rays has been determined.* For this purpose, it was necessary to admit a very small, but a known, portion of direct sunlight into the dark room in which the instrument was placed, and to allow the insolation vessel to be bathed in the pencil of rays thus admitted. By help of Silbermann's heliostate, the sun's image was reflected during the whole day upon one spot, a small opening of known size, in the window shutter of a dark room. The fraction of the total sun's rays thus admitted, and allowed to fall upon the chemical photometer, can be calculated; and the action thus effected, observed; hence the amount of action can be found which the sun would have produced if directly shining upon the instrument; a condition, impossible of course to fulfil, as the action would become too rapid, and the whole apparatus would be shattered by explosion.

The day chosen for observation of the sun's action must obviously be cloudless, if we wish to obtain an idea of the relation existing between the chemical action and the height of the sun. Beginning the observations as near sunrise as possible, we find, for instance, on September 15th, 1858, one of the days on which such a series of experiments was made, that at $7^{h.}\ 9^{m.}$ A.M., when the sun's zenith distance was 76° 30′, the observed action amounted to 1.52. That is, in one minute the column of water moved through 1.52 division; or the quantity of hydrochloric acid formed, when the sun stood at the height mentioned, was represented by 1.52 division on the scale.

Gradually, as the day wore on, the observed action for each minute became larger; until at $9^{h.}\ 14^{m.}$ A.M., the latest observation possible on the day in question, owing to the formation of clouds, the action reached 18.5 divisions, or was thirteen times as large as at $7^{h.}\ 9^{m.}$ In the last column of the accompanying table is found the action, expressed in degrees of light, which would have been observed at the foregoing times, if the whole sunlight had been allowed to fall on the instrument.

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* The full memoir on this subject is to be found in Poggendorff's *Annal.* Bd. cviii., p. 193. In Abstract, *Proceedings Royal Society*, vol. x., p. 39, 1859. *Photochemical Researches*, Part 4, by R. Bunsen and H. E. Roscoe.

TABLE I.

Hour.	Sun's Zenith. Distance.	Observed Action. 1 Minute.	Total Sun's Action in Degrees of Light.
7h. 9m.	76° 30′	1.52	5.54
7 26	73° 49′	4.22	15.50
7 40	71° 37′	6.09	22.43
8 0	68° 34′	7.56	27.85
8 7	67° 30′	8.38	38.87
8 26	64° 42′	12.48	45.85
8 54	60° 48′	17.09	62.59
9 14	58° 11′	18.51	67.61

This great increase in the chemical action with the rise of the sun in the heavens, simply results from the fact that the solar rays, in passing through the air, are extinguished or absorbed, lost, in fact, as light; and that as the sun rises higher above the horizon, the column of air through which the rays pass is constantly being lessened; consequently more of the direct rays reach the earth.

Now, the law according to which the direct rays of the sun are thus absorbed in the air can be obtained from the experiments, of which the foregoing is only an example; hence, if the action which the sun produces, when at a given height, is known, it is possible to calculate the action which it would produce at any other height.

That these calculated results agree very closely with the experimental data,—with the observed action,—is seen by comparing the numbers in Table No. II., expressing the observed and calculated action.

TABLE II.

The amount of Chemical Action effected at a point upon the Earth's Surface on any cloudless day, by the direct Solar Rays, depends alone upon the Sun's zenith distance; or upon the height of the column of air through which the Rays have to pass.

Sun's Zenith Distance at time of Observation.	Chemical Illumination of Sun's Direct Rays at the Earth's Surface expressed in degrees of Light.	
	Observed.	Calculated.
46° 8′	93.0	96.4
50° 51′	89.2	85.8
57° 35′	63.1	67.9
58° 11′	67.6	66.2
60° 48′	62.6	58.3
64° 42′	45.9	47.9
67° 30′	38.9	36.6
68° 34′	27.9	33.1
71° 37′	22.4	24.5
73° 49′	15.5	16.3
76° 30′	5.5	9.2
Probable error = ± 2.7 degrees of Light.		

Knowing the law which regulates the absorption of the chemical rays, we can calculate what the action would be if there were no atmosphere to diminish the power of the rays. It is thus found that if the sun's rays were not thus weakened, by passage through the atmosphere, they would produce an illumination represented by 318 *degrees of light:* or they would effect a combination in one minute, upon an unlimited atmosphere of chlorine and hydrogen on which they fall perpendicularly, of a column of hydrochloric acid, 35.3 *metres in height.* The sun's rays having passed perpendicularly through our atmosphere to the sea's level, effect an action of only 14.4 *light metres;* or nearly two-thirds of their chemical activity has been lost by extinction and dispersion in the atmosphere.

A large number of most interesting conclusions may be drawn from the facts already

noticed. Thus, for instance, we may determine the chemical action which the solar rays will produce on the various planets; for we know that the intensity of the chemical illumination varies inversely as the square of the distance of the planet from the sun. The numbers in Table III. express this chemical action in degrees of light, and in heights of columns of hydrochloric acid called *light metres*. Hence, we see how much the sun's chemical action varies on the different planets; the superior planets receiving so small a portion as to render it impossible that the kind of animal and vegetable life which we here enjoy can there exist.

TABLE III.—*Chemical Action produced by Direct Sunlight on each Planet.*

	Mean Distances.	Chemical Action in Light Degrees.	Chemical Action in Light Metres.
Mercury	0.387	2125.0	235.4
Venus	0.723	608.9	67.5
Earth	1.000	318.3	35.3
Mars.....	1.524	137.1	15.2
Jupiter.....	5.203	11.8	1.2
Saturn	9.539	3.5	0.4
Uranus...	19.183	1.0	0.1
Neptune	30.040	0.4	0.04

Interesting conclusions can be drawn from these facts, concerning the distribution of the chemical rays on the surface of our earth in different latitudes, and at different elevations above the sea's level. The farther removed a situation is from the level of the sea, the higher up in the atmosphere it is placed, the greater amount of chemical action it will receive. Thus, in the highlands of Thibet, where corn and grain flourish at a height of from 12,000 to 14,000 feet, the chemical action of the direct sunlight is $1\frac{1}{2}$ time as great as in the neighbouring lowland plains of Hindostan. In the same way we can calculate for any point of the earth's surface whose latitude is known, the amount of chemical action which the direct sunlight effects at any given time of day or year. In Table IV. the numbers represent the chemical

TABLE IV.—*Chemical Action effected by Direct Sunlight in One Minute on the Vernal Equinox at*

A. Melville Island.
B. Rejkiavik, Iceland.
C. St. Petersburg.
D. Manchester.
E. Heidelberg.
F. Naples.
G. Cairo.

Hour.	A.	B.	C.	D.	E.	F.	G.
6 a.m. or 6 p.m.	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7 " 5	0.0	0.02	0.07	0.22	0.38	0.89	1.74
8 " 4	0.07	1.53	2.88	5.85	8.02	13.31	20.12
9 " 3	0.67	6.62	10.74	18.71	23.99	35.88	50.01
10 " 2	1.86	13.27	20.26	32.91	40.94	58.46	78.61
11 " 1	3.02	18.60	27.55	43.34	53.19	74.37	98.33
12 at noon	3.51	20.60	30.26	47.15	57.62	80.07	105.3

action effected by direct sunlight in one minute at the places and hours named on the 21st of March. Curves were exhibited, showing the rise of the action, with the progress of the sun through the heavens. By comparing the numbers in the table, it is seen how greatly this chemical action differs at various points on the earth's surface; and we can understand how it is, that at the latitude of Cairo, where the chemical action of the direct sunlight is twice as great as it is in that of Manchester the whole flora and fauna assume a more tropical and luxuriant character.

The speaker stated, that he was only able briefly to notice the principles upon which the new mode of measuring the chemical action of light depends; adding one or two illustrations of the measurements actually made. He was unable even to refer to one of the most interesting and important applications, viz., the measurement of the chemical action effected by the diffuse daylight. This has, however, been ac-

complished, and we are now able to calculate the amount of chemical action produced by both diffused and direct solar light, on a cloudless day, at any place situated above the latitude of Cairo. The following table shows the results of such a calculation.

TABLE V.—*Total Chemical Action effected by the Solar Rays from Sunrise to Sunset on the Vernal Equinox, at*

	I.	II.	III.	IV.
Melville Island	1196	10590	11790	1306
Rejkiavik	5964	15020	20980	2324
Petersburg	8927	16410	25340	2806
Manchester.....	14520	18220	32740	3625
Heidelberg	18240	19100	37340	4136
Naples	26640	20550	47190	5226
Cairo	36440	21670	58110	6437

I. Gives the action of direct sunlight in degrees of light.
II. " diffuse daylight "
III. " total light "
IV. " " in light metres.

Knowing the intimate connexion of the chemically active solar rays with the plant and animal-producing power of a country, no one can doubt the immense importance of the establishment of a regular series of measurements of the variations of the amount of these chemical rays at different situations on the earth's surface. Such a series would open an entirely new field to the science of meteorology, and would reveal to us relations and points of difference as regards the chemical climate, at present wholly unknown.

The chemical photometer, in the hands of an experienced experimenter, is a perfectly accurate and extremely sensitive instrument; and the method described is a most valuable one for scientifically investigating the primary laws regulating the chemical action of light, and the distribution of the chemical rays. It is, however, not capable of universal application as a meteorological instrument, owing to its complicated nature, and the great care requisite in its management. At present we know of no easy, and at the same time correct, method of estimating the chemical action of light. Much time and labour has already been spent by the authors of the method described in endeavouring to prepare an instrument, which can be practically used for this purpose in meteorological observations. Persevering in their efforts, they hope ere long to overcome the numerous difficulties which beset the subject, and to describe a method which shall answer the proposed end.

ON THE RELATION BETWEEN THE ABNORMAL AND NORMAL FORMATIONS IN PLANTS.

BY MAXWELL T. MASTERS, ESQ.,
Lecturer on Botany, St. George's Hospital, &c.

THE object of this discourse was to point out certain interesting facts, relating to the natural and abnormal development of plants, and to the impossibility of drawing any absolute distinction between the two; to show their bearing upon the theory of vegetable morphology, and on the views lately propounded by Mr. Darwin. Premising that no general law can be laid down to include all plants, as each large group has, to a certain extent, its own special organization, the speaker briefly adverted to the natural conformation of plants under the following heads: 1st, Alimentary system; 2nd, Tegumentary; 3rd, Reproductive; 4th, Fibrous; 5th, Appendicular System.

All plants possess alimentary, tegumentary, and reproductive systems, and the humblest plants have no others. All plants, but Thallogens, possess in addition a fibro-vascular system, and an axis, coexistent with which is the presence of an appendicular system; in the form of scales, leaves, and in the higher plants of sepals, petals, &c. All these organs have a common origin, and this relationship is only partially obliterated throughout life; so that there is a much closer homology between the

organs of one plant, and between the organs of one class of plants, and those of another than is the case in the animal kingdom.

In considering what is natural and what is not so, a great deal is of necessity assumed. Naturalists construct for themselves a sort of type or ideal standard of perfection, which does not of necessity exist in nature, but which enables us to gain a clearer insight into the truth. If this be not borne in mind, in speaking of "the laws" of creation, &c., we are likely to be charged with the sin of presumption, and to foster the very prevalent error, that because one hypothesis is shown to be false by arguments derived from another, that the latter is of necessity true. In natural science, that theory has the greatest claims to acceptance which satisfactorily explains the largest number of facts, and by means of which our store of knowledge is most augmented.

For the present purpose, the speaker assumed the correctness of the heretofore generally received opinion of the existence of "species," endowed with a very variable, but a limited power of variation; and then proceeded to discuss what degree or extent of variability might be considered natural, and what unnatural. The distinction is not always easy, and in many cases it is impossible. Where the variation is slight, and apparently coexistent with a change in the conditions of growth, the variation is evidently natural. Allusion was made to such facts as that of peaches and nectarines found growing on the same bough, to alterations affected by changes in climate, &c. When the variation is greater, of course greater difficulty exists in determining whether or no it be natural. Reference was made to the primrose, the cowslip, and the oxlip, which differ in many important points one from the other, but which, nevertheless seem to be variations of one form; in evidence of which, amongst other facts, are these, that all three have been raised from seeds derived from the same fruit; and that in the Hookerian herbarium there exists a specimen wherein a primrose and a cowslip spring from the same stem. Some plants are especially liable to vary; such are orchids, ferns, grasses, and especially fungi, some of which latter have no less than five different modes of reproducing themselves by as many distinct organs. The speaker was enabled, through the kindness of Professor Buckman, to exhibit specimens illustrating the very curious experiments of that gentleman in ennobling the wild oat, and in producing from the seeds of two so-called species of aquatic grasses, *Glyceria aquatica*, and *Glyceria fluitans*, when grown in a dry soil, a form unlike either of the parent plants,—a form in which the herbage of *Glyceria aquatica* was combined with the inflorescence of *Poa trivialis*. The experiments of Professor Buckman have the more value as they have been made without any reference to theoretic views.*

Another difficulty in distinguishing the abnormal from the normal in plants, arises from the fact that what is unnatural or unusual in one plant, is the common condition in another nearly allied plant. In illustration of which several instances were cited; and one in particular, which led Herr S. Reissek, in some measure, to anticipate the views of Mr. Darwin. The changes took place in a species of *Thesium*, affected by a parasitical fungus, in consequence of which apparently, the plant underwent many changes, some of which caused it to assume many of the characteristics of allied species and even genera. "Suppose," says the author, "the condition originally caused by the fungus to become constant in the course of time, the plant would, if found growing wild, be considered as a distinct species, or even as belonging to a new genus. Nature appears to have set up a finger-post, to show the way in which species and genera may have been formed out of a previously existing type," &c.† Here, however, there is no reference to the ceaseless process of natural selection, and of very gradual change. Another circumstance which adds to the perplexity that is felt in distinguishing the normal from the abnormal in plants, is that irregularity of growth can hardly be considered abnormal, because it is in many instances a constant condition; the health of the plant is in no wise impaired, the irregularity does not exist at first, but arises during development, and it is subject to definite laws.

Certain changes may be physiologically abnormal, because they interfere with the due fulfilment of the functions of the part affected; and yet morphologically they can hardly be considered abnormal, because they do not violate any of the laws of morphology, and are caused perchance by a mere reversion to a simpler form.

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* Buckman, *Rep. Brit. Asso.*, 1857.
† Linnæa, vol. xvii., 1843.

Reference was then made to the classification of malformations in plants, adopted by M. Moquin Tandon, in his standard work on the subject, in order to exemplify the impossibility of drawing a line between what should and should not be deemed a malformation, for the reasons already mentioned. Even in the class of Malformations grouped under the head of "Deformity," the change was so slight as not to interfere with the physiological functions, or it was one which occurred naturally in other plants. "Peloria," or that change whereby a flower usually irregular becomes regular, may occur in two ways—one where the flower becomes regular by the increase of its irregular portions, so as to restore the symmetry, as in the Pelorian varieties of the common *Linaria;* the other, almost entirely overlooked, is where the flower preserves throughout life its original equality of proportions. The calyx of the double *Tropæolum* affords an illustration of this. The calyx of the simple form is coloured, with its upper sepal prolonged in the shape of a spur; in the double variety all five sepals are green, and of equal size. We can hardly consider a return to regularity, in whatever way it be effected, as anomalous; and it has been before shown that irregular flowers are not necessarily monstrous. It is not requisite to go through the classification of M. Moquin Tandon at any greater length, as the same remarks, to a greater or lesser extent, apply to all the groups.

As confessedly artificial distinction, it may be said that a variety is some change from the ordinary condition of a plant—a change in no wise impairing the exercise of the physiological functions—a change affecting the whole, or at least several parts of the plant,—a change which is more or less constant and permanent, and which is reproduced. On the other hand, in a monstrosity, there is a change which does more or less interfere with the due exercise of the functions of the organs affected—a change usually affecting one organ, or one set of organs in a plant,—a change, less constant and permanent than in a variety,—a change which is rarely reproduced.

Allusion was then made to the value of Teratology, as affording the basis on which the now generally received theory of vegetable morphology rests. No doubt the unusual conditions of plants, whether they be called varieties or monstrosities, arise frequently from the operation of that ceaseless struggle for existence in the battle of life, to which Mr. Darwin, as well as the late Dean Herbert, attribute so much importance; but we should be extremely careful in reasoning from malformations, and even from varieties, either in support of, or in opposition to, Mr. Darwin's views, especially if the word species be understood in its widest acceptation. The amount of change, great as it is in certain instances, is not greater than is the diversity of form under which the same individual plant may occur; moreover, the changes on which Mr. Darwin relies are small in degree, but constantly increasing. Violent and sudden changes are disavowed by him; for though the result of a struggle for life, yet they tend rather to the extinction of the organ or of the plant, than to the production of a new species. If Mr. Darwin's views be pushed to their fullest consequences, it would appear as if there were no limits to variation; and it is of the highest importance to ascertain whether this be so or not. Without forgetting the necessity of caution in employing teratological facts in such a question, the speaker cited as tending to show the probability that there were limits to variation, the fact that in the malformations of what are considered to be the most highly specialized groups of plants, those whose structure is most complex, most concentrated, and furthest removed from the leaf type, as *Compositæ*, *Umbelliferæ*, &c., little or no exaltation of the type ever occurs, whereas in other orders whose structure does not so widely depart from the leaf type, such an exaltation is frequent, though always less so than the opposite process of degeneration.

The degree of constancy is very various, and most important to be considered in questions of this kind. The speaker is under obligations to his father for the following interesting facts bearing on this point. A tree of that variety of the weeping willow, whose leaves are rolled up in a spiral coil, after retaining its character for twenty-five years, at length sent forth a shoot in an ascending direction, this shoot being clothed with flat leaves, as in the common form. There are several varieties of the sweet pea: many years of observation have shown that the white flowered sweet peas seldom, if ever, vary; but that in proportion as the flower becomes darker in colour, so is the liability to vary greater: and these changes are not confined to the colour merely, but affect the pods and other organs. So, too, the yellow varieties of the hyacinth are more constant than those of other colours. On the whole, the varieties, and still more the malformations, are characterized by a want of constancy

and a tendency to degenerate: a tendency not overlooked by Virgil, as witness the following lines:—

"Vidi lecta diu, et multo spectata labore,
Degenerare tamen; ni vis humana quotannis
Maxima quæque manu legeret: sic omnia fatis
In pejus ruere, ac retro sublapsa referri:
Non aliter, quam qui adverso vix flumine lembum
Remigiis subigit, si brachia forte remisit,
Atque illum in præceps prono rapit alveus amni."

Georg. i., 197.

A WORD ON THE PRESERVATION OF LEECHES.

BY M. TEDESCO,

Pharmacien, Arlon.

By the following very simple means, I have succeeded in preserving leeches for a long time. I put the leeches in a vessel, which, at the most, is not more than half filled with water, and place it in a cool place. I renew the water every day, and clean the sides of the vessel with a sponge. The mucus, which forms as a little white net work around the leeches, and causes a kind of strangulation or knot, is raised with care. Every fifteen days I place them in a bag, in a wet cloth, and press them, and leave them there for twenty-four hours; after having them washed, I replace them in the water; in the bag they discharge mucous matters, and thus recover all their vigour.—*Journal de Pharmacie d'Anvers*, May, 1860.

GENERAL COUNCIL OF MEDICAL EDUCATION AND REGISTRATION.

REPORT OF THE PHARMACOPŒIA COMMITTEE.

At a meeting of the Council, held at the Royal College of Physicians, London, on the 16th of June,

Present—Sir Benjamin C. Brodie, President, in the chair; Dr. Burrows, Mr. Green, Mr. Nussey, Dr. Bond, Dr. Embleton, Dr. Storrar, Dr. Alexander Wood, Dr. Andrew Wood, Mr. Watt, Mr. Syme, Dr. A. Thomson, Dr. A. Smith, Dr. Williams, Dr. Leet, Dr. Apjohn, Dr. Corrigan, Sir James Clark, Sir Charles Hastings, Mr. Lawrence, Mr. Teale, Dr. Christison, Dr. Stokes, Dr. F. Hawkins, *Registrar*.

Dr. Christison presented the following report of the Pharmacopœia Committee, which was received and ordered to be printed in the minutes:—

"*Report of the Pharmacopœia Committee, June 16th*, 1860.

"The Committee appointed by the General Council of Medical Education and Registration beg to submit to the Council the following Report of the progress made towards the completion of the 'British Pharmacopœia.'

"The British Pharmacopœia consists of two parts, and an Appendix. In the first is contained a list of all substances employed in the treatment of disease. It is, in fact, a complete list of the materia medica. Each substance is introduced, with its Latin or scientific name, the English translation of the same, its definition, and its source. These constitute the really official portion of the first part. It is, however, proposed to append to each article some of the more important characters by which it may be recognized, and the tests by which its purity may be ascertained; and, lastly, the names of the different officinal preparations into which it enters as an important ingredient, will be enumerated. This part of the Pharmacopœia has been completed, as far as the number of substances to be introduced is concerned; and has been divided into three portions, which have been allotted to the different Sub-Committees.

"The Dublin Committee have made considerable progress in their third part, and also completed some of the more important processes for the metallic preparations.

"The Edinburgh Committee have devoted considerable attention to their part of the work, and could finish it in a short period of time.

"The London Committee have completed about half their share, and the remainder is in a forward state. Specimen pages, illustrating the mode in which this

portion of the work is proposed to be framed, have been prepared for submission to the Committee.

"The list of the materia medica, or first part of the Pharmacopœia, is necessarily, for various reasons, in a less advanced state than the second half; but it is, at the same time, the portion, which may be speedily finished, when the various groups of officinal preparations are framed. Its completion requires little or no experimental inquiry, but necessarily demands that the Galenical preparations should have been definitely determined upon.

"The second part of the British Pharmacopœia consists of different groups of the preparations of substances contained in the first, together with the processes for preparing the metallic or other chemical drugs. The proposed groups, often named Galenical, are the following:—The acids, confections, cataplasms, decoctions, enemata, extracts, honey, &c., infusions, liniments, lozenges, mixtures and mucilages, ointments, plasters, pills, spirits, syrups, tinctures, vinegars, waters, and wines.

"To the Edinburgh Committee have been allotted the cataplasms, decoctions, honeys, lozenges, plasters, syrups, and waters.

"To the Dublin Committee, enemata, infusions, mixtures and mucilages, pills, tinctures, wines, and ointments.

"To the London Committee, the acids, confections, extracts, liniments, powders, spirits, and vinegars.

"Each group, when completed by any Committee, has been sent to the other Committees, received their comments, and then revised by the Committee who originally framed it.

"The secretary of the Edinburgh Sub-Committee reports that all the groups specially allotted to it have been drawn up and transmitted for revision to one or other of the associate Committees, and that this Committee has likewise commented upon the mixtures and mucilages, infusions, powders, confections, enemata, and ointments; and, lastly, it has re-examined most of its own groups, after receiving the comments of the other Committees.

"The Dublin Committee has constructed all the groups allotted to it; has transmitted them to the other Committees; has received the comments of the associate Committees upon the ointments, enemata, infusions, mixtures and mucilages, and replied to them.

"It has also considered and reported upon the acids, honeys, lozenges, confections, powders, decoctions, waters, and plasters, received either from the London or Edinburgh Committees.

"The London Committee has framed all the groups allotted to it, with the exception of the extracts; this group has been deferred, in order to allow experiments to be made during the present summer season; but it is now in a very forward state, and will soon be ready for transmission to Dublin and Edinburgh.

"The London Committee has also carefully revised and commented upon all the groups received from Edinburgh and Dublin; in fact, upon all the Galenical groups, with the exception of the tinctures and wines; and, lastly, it has revised some of its own preparations, after having taken into consideration the criticisms of the associate Committees.

"A portion of the second part of the Pharmacopœia has been set up in type, for the purpose of being submitted to the Committee.

"Having passed over in review the work which has already been accomplished by the Pharmacopœia Committee, it remains to be shown what is still incomplete, and the probable time required for its completion.

"To complete the second part of the Pharmacopœia, a few weeks only would be required, as far as the Sub-Committees are concerned.

"The first portion of the work might probably occupy a month or two longer, requiring some points to be arranged by conference; and lastly the Appendix—which will contain the substances employed only in the preparation of chemicals, but not themselves used as medicines, together with the tests for the detection of the qualities of drugs—might be estimated to occupy about a month.

"Should the Sub-Committees continue to work diligently, it is probable that the work might be prepared for press by the middle or latter end of November; but to ensure this, it may be necessary that at least one meeting of the General Com-

mittee, formed by deputies from the different Sub-Committees, should be held previous to that time."

Dr. Christison further reported from the Pharmacopœia Committee, that the Committee had felt it advisable to refer to the General Medical Council for instructions as to the powers of the Committee in certain parts of the business entrusted to them by the Council. The Council were of opinion that the Committee had rightly interpreted their powers. In connexion with this opinion, Dr. Christison, as requested by the Pharmacopœia Committee, moved the following resolutions, which were seconded by Dr. Storrar, and agreed to by the Council:—

"1. That it be remitted to the Pharmacopœia Committee, either to dispose of the forthcoming edition of the British Pharmacopœia to a publisher or publishers, or to publish the edition as the property of the General Medical Council, according as the Committee shall judge to be expedient."

"2. That, in the event of the Committee resolving to sell the edition, the Executive Committee of the General Medical Council shall have the power to grant, in favour of the publisher of the work, such title in the property of it as the General Council can grant."

"3. That the sum of 500*l.* be voted by the General Medical Council, in addition to the vote of November 24th, 1858, towards defraying the current expenses of the Pharmacopœia Committee."

NEW FRENCH CODEX.

The Pharmaceutical Society of Paris is at present preparing the materials for the drawing up a new Codex, or Pharmacopœia, with a view to facilitate the work of the committee shortly to be appointed by government for the publication of that work.—*Lancet.*

NATIONAL MEDICAL CONVENTION FOR REVISING THE PHARMACOPŒIA OF THE UNITED STATES.

The Fifth Decennial Meeting of the above Convention took place at Washington City, on the 2nd of May, when Dr. George B. Wood, President of the Convention of 1850, was re-elected. After the election of the other officers, the Committee reported the attendance of delegates from the various medical and scientific bodies of the union, whose contributions towards a revision of the National Pharmacopœia were received and referred to a Committee.

A report was brought in by Dr. Bache, and adopted, one of the resolutions of which provided that there should be a Committee of nine to revise and publish the Pharmacopœia; also, that three form a quorum, and that the place of meeting be in Philadelphia.

A proposition of the New York College of Pharmacy was embodied in a resolution and carried:—"That in the index of the Pharmacopœia the syllables of both Latin and English names be so divided and accented that the index may also serve as a pronouncing vocabulary to the Materia Medica."

The subject of weights and measures was introduced: Mr. Parrish advocated the making the avoirdupois ounce the standard; Mr. Taylor advised the abolishing of the troy and avoirdupois scales now in use, and substituting the grain as the unit for all weights less than a pound avoirdupois. He also proposed to do away with the Roman symbols, and use the common Arabic figures. Dr. Bache thought it better, for the sake of uniformity, to wait the action of the British Commission on the subject of the consolidation of the London, Edinburgh, and Dublin Pharmacopœias into a British Pharmacopœia, and see what was done there before they acted.

The Committee of the Philadelphia College have recommended the addition of 94 new preparations, and the rejection of 7 of those at present in the Pharmacopœia. The Committee will publish the work as soon as their labours are completed, but will wait its final completion for the publication of the British Pharmacopœia.

PHARMACEUTICAL PROSPECTS IN AUSTRALIA.

We have frequently been applied to by young men respecting the advantages possessed by our Australian colonies for the practice of Pharmacy, and the following letter from one who has had personal experience in that part of the world, will no doubt be welcome to those who contemplate making Australia the scene of their labours:—

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Melbourne, Victoria, April, 1860.

Sir,—Permit me, through the instrumentality of your columns, to call the attention of chemists' assistants to the inducements offered by these colonies. Qualified assistants are at present, in spite of a depressed trade, commanding salaries which in England are almost unheard of. I, eighteen months ago, engaged a young man, aged twenty-one years—a fresh arrival—as soon almost as he landed, for £80 per annum, and am now paying him £110, in addition to some £15 or £20 he has the privilege of making for himself by drawing teeth. He is leaving me, because in Geelong he is offered £150 per annum, washing included.

When I tell you that an assistant's personal expenses need scarcely exceed what is incurred at home for clothes, &c., it must be quite superfluous to add any comments of my own. I may, however, state, that the business here is a very pure one, and not at all confounded by admixture with other trades, nor are the duties onerous or disagreeable. The assistant here is almost on equal terms with the employer; to such an extent, indeed, as to surprise those who first become acquainted with the fact.

Sober, steady assistants have always been scarce here and at a premium, and any such could not fail in immediately procuring employment at rates of wages, such as in a very short time will enable them, if they wish, to enter into business on their own account, or return to Europe.

I advise young men not to be deterred, by the too anxious foreboding of friends, from making the experiment; they will not regret it.

As this letter is sent in the most perfect good faith,

I subscribe myself, your obedient Servant,

Wm. Johnson,

Vice-President of the Pharmaceutical Society of Victoria.

DR. INMAN ON FOOD.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—My attention having been directed to the report, in your number for May, of the remarks on liquid foods made at Liverpool by Dr. Inman, I beg to express my regret that details were not entered into. The definition given by Dr. Inman, that food replenishes waste, removes alcohol altogether from the list of foods; why, then, in the subsequent portion of the lecture, travel out of the record to recommend that kind of food for its excellency which is not food at all? I meet the general assertions of benefit from the use of alcoholics with a general denial, and wait for the cases. When they are given, it will be seen whether alcohol aided health and life, or whether (which is far more likely) health and life had a lucky escape from its potent charms.

Unless your space is sufficient for fair evidence, you had better not occupy it with thoroughly mischievous and erroneous popular fallacies.—Respectfully yours,

Hy. Mudge, Surgeon, &c.

Bodmin, 14th June, 1860.

PATENTED SYPHONS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—I was much surprised to find at the last Conversazione of the Society a palpable copy of my patent syphon, which has been exhibited at the Society's Conversaziones for these seven years past—the first time being in the year 1853, in which year it was advertised in the *Pharmaceutical Journal*—this infringement of my patented invention being termed Musselwhite's Patent Syphon. Now, as I have made and sold a great many of these syphons, I am certainly much astonished that any person should now come forward claiming the invention as new, especially as I have not given up the manufacture, or allowed the invention to fall into disuse. It is only another instance of the imperfections of our patent law, which quietly permits a man to appropriate not only the use, but to claim the position of, inventor of an article patented years before. Yours very obediently,

JOHN A. COFFEY.

MISCELLANEA.

Silvering Glass and Porcelain.—Mr. E. R. H. Unger, in a letter to the editor of the *Chemical News*, states:—In making various experiments the other day with nitrate of silver, I happened to add to a small quantity of a strong solution of that compound an equally small quantity of a thick alcoholic solution of tannin. The quantity, though small, was exposed with a comparatively large surface to the atmosphere, by making use of a flat-bottomed evaporating dish.

About an hour afterwards I happened to direct my attention to this dish, and found to my great surprise that the surface in the dish was coated with a thin, brilliant, uniform layer of metallic silver. I directly repeated the experiment, and met with the same result again and again. I next proceeded to evaporate the liquid to dryness by placing the dish on the surface of warm sand. As soon as it was completely dry, the coating was found to be so fast on the porcelain that it required the point of a sharp penknife to scrape it off.

From these experiments I would venture to conclude that porcelain, and any other stony and smooth surface, might be plated with silver, and if so it might be useful in many of the arts.

I would add, in conclusion, that I also succeeded in producing a metallic brilliant coating from a saturated solution of sulphate of copper by the same solution of tannin. May I ask of you the favour of granting these lines a space in your valuable columns, so as to induce practical chemists and others further to investigate the subject?

Alum Pastilles.—A Venetian physician, Dr. Argenti, proposes the use of alum pastilles, in place of alum solutions, prescribed as gargles in laryngo-pharyngeal anginas, in aphony and dysphony of singers, as well as for aphthous ulcerations of the mouth, whether these are simple, scorbutic, scrofulous, mercurial, or typhoid. The formula is as follows:—℞. Aluminis, gum arab. sacchari, water distilled several times with cherry laurel, aa, q. s. To make pastilles weighing forty centigrammes (six grains), containing from two to three centigrammes of alum. The mass, being well manipulated, and extended on a sheet of paper, cut up in pastilles and dried at a low heat, furnishes a preparation in which the stringent taste of the alum is mitigated by the other agents, and which can be preserved for some months. The pastilles are allowed simply to dissolve in the mouth, when the saliva bears the medical agent to the affected parts.—*Bullet. Gén. Thér.*

Camphor in Powder and Ointment.—Camphor may be very easily powdered by contusion in a large marble mortar, adding a small quantity of water, and passing it through a hair or silk sieve, according to the degree of fineness required. When powdered in this manner, the camphor never runs into lumps even when kept a long time. To make a good ointment:—Three parts of camphor so pulverized should be melted by aid of a bath in twelve parts of prepared lard; and the mixture, as soon as it begins to be a little cold, should be stirred from time to time until it entirely sets—thus preventing the granular crystallization always observed in ointments which are allowed to set without stirring. This ointment preserves its smoothness and consistence for a year after its preparation.—*Journal de Chimie Méd.*, April, p. 219.

Opiated Colchicum Wine.—This preparation is recommended in acute rheumatism by Dr. Eisenmann of Warzburg, where it is known as "Eisenmann's Drops." It consists of twelve parts of colchicum wine, two parts of tincture of opium; twenty drops being taken for a dose. The colchicum wine is prepared according to the formula of the Prussian Pharmacopœia, which directs 150 parts of colchicum seeds to be macerated in 770 parts of alcohol.—*Bulletin de Thérap.*

Syrup of Iodide of Potassium.—This syrup has been used in the wards of MM. Ricord, Nélaton, and Richelot. It is made as follows:—Iodide of potassium, 10 parts; syrup of bitter orange-peel, 500 parts.—*Mon. des Hôp.*

Extractum Sanguinis.—Dr. Foy (*Bull. de Thér.* lxii., p. 12) recommends the administration of the extr. sanguinis of calves, oxen, and lambs in all anemic conditions (as chlorosis). He directed the preparation of gelatine-capsules (with 10 parts of extract sang. to 1 of sod. phosphit.), each containing from 4 to 8 grains, of which he gives 10, 15, and sometimes 20 a day.—*Philadelphia: The Medical and Surgical Reporter.*

Juice of Chelidonium Majus has been locally applied with the most satisfactory results in cases of greatly itching eczema, injuries from nettles, and other itching diseases of the skin, by Grand-Clement (*Bull. de Thérap.* lvi., p. 336). Mixed with an equal quantity of glycerine, it can be preserved and used for the same purpose at times when the fresh plant cannot be obtained.—*Ibid.*

Oil of Aleurites Triloba.—O'Rorke (*Bouchardat's Annuaire*, 1859, p. 117) speaks very highly of the purely purging (not like the oils of other euphorbiaceæ often at the same time emetic) effects of this oil. It is almost as mild as castor oil, but is much better to take, being more fluid, and without taste and smell. He classifies the oils of the euphorbiaceæ according to their effects and doses, as follows:

1. Those producing vomiting and purging: croton oil (1-2 drops), oil of jatropha curcas (8-10 drops), oil of euphorbia lathyris (15-30 grs.), oil of anda gomesii (30-46 grs.), oil of hura crepitans (80-160 grs.), castor oil (at least ʒi.-ij.).
2. Producing purging only: oil of aleurites triloba.
3. Without effect: oil of omphalæa triandra Lindl.
4. Oils of uncertain effect: elæococca verrucosa? and stillingia sebifera?—*Ibid.*

Ice in place of Distilled Water.—In the United States of America, the druggists frequently employ ice in place of distilled water. A filter is filled with small fragments which are left to melt, and water thus obtained is almost quite pure. Void of chlorides and sulphates, it can be substituted for distilled water on almost all occasions.—*Moniteur des Hôp.*, No. 32.

Poisonous Toys.—The *Journal de Médecine*, of Brussels, publishes the following: M. Dumont, an apothecary of Boussu, relates that a child six months old was brought to him writhing with pain. Perceiving that the lips of the child were soiled with a white substance, he wiped off some of it with his finger, and ascertained that it was white lead. The child had been sucking the head of a doll, which still hung from its neck, and had consequently swallowed a large quantity, for its age, of this deleterious substance. Purgatives and opiates were immediately administered, and after a short time the little patient recovered. Minium is used for red paint, while green and yellow are sometimes derived from arsenical preparations, which, owing to their cheapness, are also used for painting the coarser sort of children's toys.

Leakage of Gas in the Metropolis.—Dr. Letheby, in his report recently presented to the City Commissioners of Sewers, states that the quantity of coal gas which escapes into the street earth of the metropolis amounts to no less than 386,000,000 of cubic feet per annum, or five per cent., which not only darkens the soil and makes it offensive, but also impregnates the atmosphere of the sewers, rendering the basement rooms of houses uninhabitable, from the poisonous action of the gas. The remedy suggested by Dr. Letheby is twofold: first, the supply of gas freer from ammonia and sulphur; and, secondly, the use of tighter joints.

Accidents from Lucifer Matches in France.—It is said that the insurance offices intend presenting a petition to the Emperor, praying that a law may be passed to prohibit the sale of matches made with white phosphorus, and allow none but

those made from amorphous phosphorus to be made for the future. Official returns show that the average annual number of accidental fires in France was about 2200 previous to 1838, when friction matches came into use. Since that time the number has been constantly increasing, till in 1857 there were 10,000 fires.

Death from Carburetted Hydrogen.—On Wednesday morning, May 30, between 7 and 8 o'clock, the inhabitants of Mungret Street, Limerick, and adjoining neighbourhood, were alarmed by a report that a family, five in number, consisting of the mother and four children, who resided in an underground cellar, had been found dead in their beds, through poisoning or suffocation from the effect of an escape of gas. It appears that the head of the family, a man named Tom Connors, on returning home, knocked as usual at the cellar door, but received no answer; he knocked again and again without effect, until a man named Sulivan, who lived in the shop overhead, exclaimed they were dead, else they would have heard him, and getting a crowbar he forced the passage, and on entering the cellar the stench of gas was almost unbearable, but he and the husband rushed to the beds, and found the mother and children in an apparently lifeless state, quite prostrate and inanimate. Assistance was called in, and the sufferers were conveyed on cars to Barrington's Hospital, and on entering the institution it was found that one child, a girl aged two years, was dead, and the remainder in such a lethargic state of insensibility and stupor, that it was unknown how soon they too would cease to exist. The proper remedies were assiduously applied by Dr. Bourke and by Dr. Gelston, one of the leading physicians of the hospital. The most energetic measures were resorted to for some time, until at length the three children evinced symptoms of returning animation. The medical gentlemen continued their operations for over three hours, until at length the children were pronounced out of danger; but the mother continued insensible, without hope of recovery. The occurrence was accounted for by an escape of gas from a pipe which ran through the cellar, communicating with the meter in the shop above, but, the street having been dug up, an escape was discovered seven feet from the gas meter.

A correspondent (C. K.), in a letter to the *Times*, in reference to the above, states:—The accident from gas, mentioned in the *Times* of to-day, is full of instruction; the case is new; the gas (carburetted hydrogen) acting here like chloroform, but life continued for several hours. The instruction suggested by the case is this:—That many cases, in every-day life, of what are supposed to be fainting-fits and diseased heart, which are met by physicians, are due to smaller quantities of this gas inhaled in bedrooms, dining-rooms, &c., which are badly ventilated, especially at night. It is not generally known that in large quantities this gas acts like chloroform; in small quantities it explodes and does comparatively less mischief.

Death from Opium.—An inquest has been held at Chatham, on the body of Mr. Alfred P. Fowler, manager of the Brompton business of Messrs. Copeman and Lacy, army contractors. Prof. Taylor stated that death was caused by the accumulation of opium in the body. It appeared that six pills had been sent, but four only had been taken; each pill was said to contain one grain and one third of opium, given over a period of four hours. It was an unusual circumstance that death should have resulted from so small a dose of opium; the smallest single dose known to have killed an adult being four grains. He attributed the fatal effects to the peculiar nature of the disease, and thought that Dr. Burton was fully justified in what he had done. The jury returned the following verdict:—"We find that Alfred Porter Fowler died from the effects of opium administered to him for the treatment of rheumatic fever, and that the jury consider, from the medical evidence produced, that Dr. Burton was justified in following out the treatment in the way he did, and exercised more than ordinary skill."

It has been stated in the puplic papers that alarming symptoms resulted from a comparatively small dose of laudanum in the case of Madame Ristori, for whom a physician had ordered a draught with fifteen drops of laudanum, but the chemist who made the draught put thirty drops by mistake.

Suicide by Cyanide of Potassium.—An inquest has been held at the Running Horse Tavern, Harrow Road, on the body of Miss Annie Green, who died from the effects of cyanide of potassium. The jury returned the following verdict:—"That the deceased died from the effects of cyanide of potassium, administered by her own hand while in an unsound state of mind."

Pigs Poisoned by Hellebore.—Mr. Barker, a farmer at Habton, in Yorkshire, has lost several valuable pigs from this cause. It appears that some powdered hellebore, used for killing lice on stock, had been found by one of the servants, and although labelled, was supposed to be "colouring," and was mixed with milk. The mixture proving a failure, it was thoughtlessly put into the pig tub, and the consequence was the poisoning of nearly a dozen pigs.

DEATH OF A CHILD FROM STRYCHNIA.

On Friday, June 8th, Mr. G. S. Brent, deputy coroner for West Middlesex, held an inquiry at the Rose of Normandy, High Street, Manchester Square, on the body of Catherine Annie Bell, aged eleven years, daughter of Mr. Alexander Bell, proprietor of the Medical Hall, High Street, Manchester Square, who died from the effects of strychnia. Mr. Alexander Bell, chemist and druggist, said deceased was his daughter. He was present at her death, which happened on Tuesday, June 5th, about eight o'clock in the evening. About half-past six, himself, apprentice, and deceased were in the back room. They had just taken tea, and witness went out to serve a customer, when he heard a scream. He returned to the room and found his daughter sick. He thought nothing of it, and returned to his customer. His daughter continuing her screaming, he again went to her, when she said, "I am dying; I have taken strychnia." Her cries roused a lodger and a servant, and witness at once sent for medical assistance. Three gentlemen attended, and an emetic was given. She suffered considerably and was convulsed, and remained sensible for an hour and a half afterwards. The poison cupboard was outside the shop, to which she had access from the surgery. She had frequently heard them talk about poisons, and he believed she had gone to this cupboard from curiosity. He did not find any difference in quantity in the bottle. She was a particularly intelligent child, and very inquisitive. The cupboard was usually locked, but the lock was out of order. Emma Garner, servant to Mr. Bell, described the screaming of the deceased. She heard her say she had taken poison, strychnia, and was dying. She was in strong convulsions for a long time. The mother of the deceased took her to school at two o'clock on the afternoon of her death. She never heard her threaten to poison herself or complain of ill treatment. Medical evidence having been given, the jury agreed that death was caused by the taking of strychnia; and a *post-mortem* examination of the body was ordered to be made.

DEATH FROM AN OVERDOSE OF CHLOROFORM.

An inquest has been held at Doncaster, on the body of Frances E. N. Mansell, wife of a commercial traveller in that town. The deceased had been for years in the habit of taking chloroform; and notwithstanding that both her medical attendants and her husband had used all means to prevent her obtaining it from the druggists, she was supplied with no less than five ounces on one occasion. She used an ounce at a time, and on each occasion she went to bed, her daughter, only ten years of age, attending upon her, and removing the cloth (upon which the chloroform was poured) from her mouth when she thought she had inhaled sufficient. The deceased took the last dose at ten o'clock, having procured it a short time before, and at eleven o'clock the children, who were alone in the house, found her dead. From the examination of witnesses, it was shown that the deceased had procured the chloroform from Mr. Martin, druggist, against the wish of her friends. The jury returned a verdict that the deceased had died from an overdose of chloroform incautiously taken, and they further added, "The jury cannot separate without strongly censuring Mr. Martin for persisting to supply the deceased with such a dangerous agent after the repeated warnings of Mr. Moore, one of the medical men, and Mr. Mansell; and the jury further recommend that in any future bill for the sale of poisons, chloroform be included under the same restrictions as other poisons."

REMARKS ON THE LAST ILLNESS OF JACOB BELL.

The Council of the Pharmaceutical Society having expressed an opinion that some references made to the last illness of Mr. Jacob Bell at the late Annual Meeting would be very gratifying to Mr. Bell's friends throughout the country who were not present at the Meeting, the following statement of what was said at the conclusion of the remarks made by Mr. George Edwards, of Dartford, on the occasion referred to, has been kindly furnished by Mr. Edwards in compliance with an application made to him by the Editors.

"And now a few words with reference to Mr. Bell, not to add much to the expressions of regret and respect which have already been uttered, for I do not know that any more are needed. As far as this world's reward is concerned, he had what he desired. The steady progress of the Society which he cherished—its increasing influence and power—this scaffolding which is around us now, and which tells of enlarged establishments—these are his monuments; and in the midst of these, and amongst the affectionate regrets of his friends and fellow-labourers, he passed away. Few of us would desire any more. But with all this in the minds of some of us, other thoughts will mingle. I was reminded of them last night when I looked upon the portrait which hung upon these walls, that wondrous production of Landseer, and as I gazed upon the wasted form, worn out by efforts in the service of this Society, I could not resist the conviction that there needed something more than this success to rest upon, when life and health were fading away, and I rejoice to think that our friend had something more. We have all heard that in his last illness he became again acquainted with an excellent clergyman at Tunbridge Wells, the friend of his boyhood, and that their renewed intercourse was most profitable to him; and that a letter was addressed to his friends after Mr. Bell's death, conveying most gratifying and satisfactory information as to his peaceful end. I have seen that letter—I have a copy of it—it is laid up amongst my treasures; and I rejoice when I look upon it, to know that he had not only the satisfaction of earthly renown, but the more precious support which religion can give. I do not mean that which is a poor, empty thing of forms and ceremonies, but that which is 'mighty to save.' I rejoice to know that, busied and cumbered as he had been about outward and earthly things, he had also found Mary's part, and heard from the Master his life-giving words; and I think, therefore, of my friend, without misgiving or fear, that his powers were, after all, like a bright sparkle, which glitters for a while, only to pass into cloud and uncertainty for ever.

"And I say these things too for the young amongst us, who must soon succeed to the management of that which he so well supported, for grey heads are many among your Council, and most of us have passed the meridian of life. We look not at the rising but at the setting sun. Do not think that you can plead Mr. Bell's example if you are tempted to sneer at things that are sacred. Do not think that his acute and scientific mind was too well informed to admit the claims of revealed religion; but remember, that whilst his counsels and liberality urge upon you to take advantage of every opportunity to acquire that which may be of profit and honour to you in the path you have chosen, his example and early decline call upon you too to make the best of both worlds, and seek to meet him by-and-by."

REVIEW.

THE SEVEN SISTERS OF SLEEP. By M. C. COOKE, Director of the Metropolitan Scholastic Museum. London: James Blackwood, Paternoster Row.

UNDER the above title, Mr. Cooke has written a popular and amusing history of the seven prevailing narcotics of the world—namely, Tobacco, Opium, Hemp, Betel, Coca, Thorn-apple, and Amanita.

We could have desired that the author, who is evidently well informed upon the subjects on which he treats, had, in many cases at least. adopted a different phraseology and mode of illustration; but, with this drawback, the work contains much matter that is interesting and important for the Pharmaceutical Chemist and others to be acquainted with; and, at the end of the volume, there are appended some carefully compiled statistical details, which cannot but be consulted with advantage.

BOOKS RECEIVED.

CURIOSITIES OF SCIENCE, SECOND SERIES: *A Book for Old and Young.* By JOHN TIMBS, F.S.A., &c. (Second Thousand.) London: Kent and Co., Paternoster Row. 1860.

THE BRITISH JOURNAL OF PHOTOGRAPHY. Edited by GEORGE SHADBOLT. Vol. vii., No. 119.

TO CORRESPONDENTS.

J. H. S. (Manchester).—(1.) The Minor Examination comprises the Latin Language, Pharmaceutical and General Chemistry, the Chemistry of Poisons, Materia Medica, and Botany. (2.) The Manchester Chemists' Association. (3.) The amount of fees for lectures will be found on the cover of this Journal.

D. G. N. (Aylsham).—The paper required may be obtained of any artists' colourman.

R. R. (Florence) is thanked for the specimens. (1.) It is uncertain when the work will appear. See page 37. (2.) *Ferri et Quinæ Citras* may be made by dissolving four parts of citrate of iron and one of citrate of quinine in distilled water, and carefully evaporating the solution, that scales may form. (3.) No.

Libra.—Twelve ounces.

M. P. S. (Rugby).—We are unable to give the information. Application should be made at the War Office, Medical Department.

A Constant Reader.—We have tried the experiment, but did not obtain the result indicated.

An Associate (Cornwall).—Mitchell's *Manual of Practical Assaying.*

Labor omnia vincit is thanked for his communication.

We are requested by Mr. Herapath to state that, as some communications intended for him do not reach their destination, applications should be addressed as follows :—William Herapath, Sen., F.C.S., Professor of Chemistry and Toxicology, Bristol School of Chemistry.

ERRATUM.—Page 590, line 13 from top, *for* "To Mr. Haselden, for a chlorine inhaler and fumigator," *read* "To Mr. Haselden, for an inhaler and a chlorine fumigator."

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, ELIAS BREMRIDGE, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. CHURCHILL, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

LIST

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MEMBERS, ASSOCIATES, AND APPRENTICES

OF

The Pharmaceutical Society of Great Britain.

1860.

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Deane, Henry.....Clapham
Edwards, George.....Dartford
Edwards, John B.....Royal Institution, Liverpool
Evans, Henry Sugden.....52, Hanover Street, Liverpool
Haselden, Adolphus F.....18, Conduit Street
Herring, Thomas.....40, Aldersgate Street, City
Hills, Thomas Hyde.....338, Oxford Street
Hollier, Elliott.....Market Place, Dudley
Lescher, Joseph Sidney.....60, Bartholomew Close
Macfarlan, John F.....17, North Bridge, Edinburgh
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Sandford, George Webb.....47, Piccadilly
Standring, Thomas.....1, Piccadilly, Manchester
Waugh, George.....177, Regent Street

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Maclagan, Douglas, M.D., F.R.S.E., Edinburgh.
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Martiny, Julius, M.D., Gaualgesheim, Hesse Darmstadt.
Martius, Carl Friedrich Philipp von, M.D., F.R.S., Munich.
Martius, Theodor Wilhelm Christian, M.D., Ph.D., Erlangen.
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Mitscherlich, Carl Gustav, M.D., Berlin.
Mohr, Friedrich, M.D., Coblentz.
O'Shaughnessy, Sir William Brooke, M.D.
Pelouze, —, Membre de l'Académie des Sciences, Paris.
Procter, William, Jun., Philadelphia.
Rees, George Owen, M.D., F.R.S., No. 26, Albemarle Street, Piccadilly.
Reid, David Boswell, M.D., F.R.S.E., Edinburgh.
Rose, Heinrich, M.D., F.R.S., Berlin.
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Wood, George B., M.D., Philadelphia.

FOREIGN AND COLONIAL LIFE MEMBERS.

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1858	486	Avice, Charles Ernest	Mauritius
1848	34	Baeër, Gustave E.	Strasbourg
1855	401	Baissac, Pierre Joseph	Mauritius
1859		Baker, George S.	Geneva
1852	167	Baschet, George Constant	Mauritius
1858	505	Baschet, Pierre Edmond	Mauritius
1849		Baylis, William	Launceston, Tasmania
1852		Bishop, William	Wellington, N. Zealand
1858	506	Boullé, Janvier Alfred	Mauritius
1852		Carpenter, Henry	Demerara
1854	347	Dru, Casimir Theodore A.	Mauritius
1849	74	Fleurot, Emile	Mauritius
1855	389	Francis, Henry	Melbourne
1859	3	French, Joseph B.	Castlemaine, Australia
1853		Guiot, Jean Felix E.	Mauritius
1850	82	Lamusse, Louis A.	Mauritius
1847		Lediard, Charles	St. Vincent
1847	28	Mailloux, Joseph	Mauritius
1851	93	Mailloux, Auguste	Mauritius
1859	558	Mathew, John Alfred	Cape Town
1858	508	Minet, Alphonse Edouard	Mauritius
1847	19	Nobrega, Gerardo Jose da	Madeira
1855	407	Noël, Ferdinand	Mauritius
1859	549	Perrot, Pierre Bénoni	Mauritius
1852	118	Regnaud, Charles	Mauritius
1860	588	Renaud, Desiré Monchéry	Mauritius
1850		Roberts, Henry	Florence
1852		Roberts, Thomas H.	Gibraltar
1843		Rogers, Henry	Bombay
1852	72	Sinimberghi, Nicholas	Rome
1858	467	Skinner, Henry	Kingston, Canada West
1844	1	Sparks, John	Bombay
1844		Stewart, F. H.	Demerara
1857	468	De Valancé, Charles P.	Mauritius
1859		White, Robert	California

The figures in the second column correspond with the number of the Certificate of Examination.

LONDON MEMBERS.

Year of Membership.	No. of Certificate.	NAME.	ADDRESS.
1850	70	Allchin, Alfred	32, Cole's Terrace, Islington
1843		Allen, George	7, Cowper Street, City Road
1841		Allen, William	2, Morgan's Place, Islington
1853		Ambrose, John	1, Union Place, Commercial Road
1844		*Ambrose, Thomas	94, Whitechapel Road
1842		Anderson, Charles	23, Lower Belgrave Street
1857	241	Andrews, Frederick	23, Leinster Terrace, Upper Hyde Pk. [Gardens
1842		Appleton, Thomas Cass	45, Curzon Street
1841		Ashton, William	154, Sloane Street
1853		Attwood, Alfred	61, Cannon Street
1841		Austin, Henry	161, Bermondsey Street
1853		Bailey, Delamore J.	30, Conduit Street
1857	242	Baines, William H.	61, Cannon Street, City
1841		Baiss, William A.	102, Leadenhall Street
1841		Baiss, James	102, Leadenhall Street
1841		Baker, William J.	21, Brecknock Place, Camden Town
1845		Ball, Thomas M.	77, St. George's Road, Southwark
1841		Balmer, John	94, St. John Street Road
1841		Barber, Thomas A.	2, Scott's Place, Islington
1842		Barber, Joseph	7, Orange Street, Red Lion Square
1856		Barkley, William	18, Little Tower Street
1848		Barnard, John	1, Oxford Terrace, Clapham Road
1853		Barnes, James B.	1, Trevor Terrace, Knightsbridge
1853		Barron, Frederick	2, Bush Lane
1858	504	Barrs, John Adcock	55, Fore Street, City
1841		Barry, John T.	Plough Court, Lombard Street
1841		Bartlett, William	1, Brettin Place, Chelsea
1844		Bastick, William	2, Brook Street
1841		Bayley, Edmund	26, Leadenhall Street
1851		Beaton, John	174, Shoreditch
1853		Becket, William E.	6, Giltspur Street
1853	17	*Bell, William Henderson	48, Albany Street, Regent's Park
1842		Bentley, William	11, Mount Street, Bethnal Green
1841		Best, John D.	26, Suffolk Street, Pall Mall
1841		Bigg, Thomas	Great Dover Street
1855	270	Biggs, Walter	19, Notting Hill Terrace
1842		Binge, Thomas	23, Stockbridge Terrace, Pimlico
1841		Bird, William L.	42, Castle Street East
1850	57	Bird, Augustus	22, High Street, Kensington
1859	322	Bishop, Alfred	Mile End New Town
1843		Blake, Charles T.	47, Piccadilly
1842		Bland, John	57, Penton Street, Pentonville
1841		Blandford, John F.	9, Bruton Street
1853		Bolton, William	146, Holborn Bars
1842		Bond, Henry	11, Cross Street, Hoxton New Town
1853		Boothby, Henry Neal	72, Crawford Street
1842		Boully, Peter	Queen's Road, Bayswater
1849		Bourdas, Isaiah	10, Pont Street, Belgrave Square
1842		Bowden, Edward	13, Charles Street, St. James's
1852		Bower, William	96, Tottenham Court Road
1842		Bradley, John	21, Belgrave Road, Westminster
1847		Brewer, Eli	43, Duke Street, Manchester Square

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Year of Membership.	No. of Certificate.	NAME.	ADDRESS.
1857	50	*Brewer, John W. N. T.	...5, Liverpool Street, City
1853	190	Bromley, Richard Martin	...Denmark Hill
1845		Brooks, Charles	.....Southville, Wandsworth Road
1842		Brown, James	.....27, Aldgate
1842		Buck, Thomas	.....Kingsland Green
1842		Buckle, Christopher F.	.....3, North Place, Gray's Inn Road
1846		*Bucklee, William H.	.....86, New Bond Street
1845		*Burden, Edward	.....38, Duke Street, Grosvenor Square
1846		Burden, Thomas	.....6, Store Street, Bedford Square
1841		Burfield, Henry	.....180, Strand
1853		Burgoyne, James	.....31, Throgmorton Street
1857	333	*Butt, Edward Northway	....235, Oxford Street
1855		Carr, John	.....171, High Holborn
1853		Carrick, James	.....46, Churton Street, Belgrave Road
1853		Carty, John	.....172, New Bond Street
1853		Cattell, George	.....Camberwell New Road
1853		Chard, Frederick J.	.....13, Eccleston Street South
1853		Chubb, James C.	.....59, St. John Street, Clerkenwell
1845		Clarke, Benjamin	.....Mare Street, Hackney
1853		*Cockrill, James	.....2, Wellington Street, Waterloo Town
1849		Cocksedge, Henry B	.....20, Bucklersbury
1852		Colchester, William M	.....2, Crown Street, Hoxton
1842		Coles, John	.....New Road, Camberwell
1854	191	Coles, Charles	.....72, Euston Square
1845		Collins, John R.	.....Haverstock Hill
1853		Collins, Robert N.	.....Oxford Court, Cannon Street
1841		Compton, Charles	.....14, Brewer Street, Golden Square
1841		Constance, William	.....5, Hanover Place, Regent's Park
1848		Constance, Edward	.....37, Leadenhall Street
1853		Cooke, John	.....171, Hoxton Old Town
1848		Cooper, William T.	.....26, Oxford Street
1853		Cooper, Robert H.	.....20, Royal Exchange
1847		Corfield, Daniel	.....22, Thrawl Street, Spitalfields
1853		Cornelius, Joseph	.....Clapham
1848		Cowdery, George T	.....36, Paternoster Row
1845		Cracknell, Charles	.....107, Edgware Road
1859		Crispe, James	.....4, Cheapside
1858		Crocker, Edwin	.....19, Richmond Road, Islington
1853		Cross, Henry	.....4, Shepperton St., New North Rd.
1841		Croucher, John T	.....223, High Street, Shadwell
1853		Croyden, Charles	.....37, Wigmore Street
1842		Cullen, William	.....37, Beckford Row, Walworth
1852		Curtis, Frederick	.....15, Crawford Street
1853		*Darby, Stephen	.....140, Leadenhall Street
1842		Davenport, John T.	.....33, Great Russell Street, Bloomsbury
1841		Davies, Charles	.....11, Claremont Place, North Brixton
1845		Davies, Henry E.	.....43, Wood Street, City
1860	377	Davies, William G	.....28, Sidney Place, Commercial Road
1841		*Davy, Charles	.....100, Upper Thames Street
1841		Deane, Henry	.....Clapham
1850		Dickinson, William	.....16, Cambridge Street, Edgware Road
1842		Doughty, Edward William.	.4, William Street, Knightsbridge
1841		Down, John	.....1, Queen's Road, Bayswater
1841		Drew, James	.....2, Bush Lane, Cannon Street
1859	352	Dyson, William B	.....4, Gloucester Rd., South Kensington

Year of Membership.	No. of Certificate.	NAME.	ADDRESS.
1845		Eade, George	39, Goswell Road
1847		Eardley, John	14, Charles St., Westbourne Terrace
1841		Eddy, Charles W.	30, Crown Street, Finsbury
1853		Edwards, William S.	14, Eltham Place, Old Kent Road
1853		Elam, Benjamin	196, Oxford Street
1853		Elkington, Edward	56, Grange Road, Bermondsey
1849		Ellis, George H.	4, Pavement, Finsbury
1853		Elvey, Thomas	8, Halkin Street, West
1841		Evans, John	60, Bartholomew Close
1851		Evans, John H.	60, Bartholomew Close
1841		Farmar, Robert A.	40, Westminster Road
1841		Faulconer, Robert H.	Keen's Row, Walworth
1853		Fells, John	Stockwell
1853		Fenn, John T.	83, Regent Street, Westminster
1841		Field, William	27, Queen's Buildings, Brompton
1856	88	*Field, James John	5A, Holloway Place, Holloway
1842		Fincham, Robert	57, Baker Street
1847		Fincham, Zacariah C.	57, Baker Street
1858	445	Ford, Charles	Bayswater
1858	160	Forrest, Richard	9, Celbridge Place, Westbourne Park
1842		Foulger, Samuel	133, St. George's Street, East
1841		Fowler, Richard	14, Brewer Street, Golden Square
1841		Fox, William	48, Church Street, Bethnal Green
1856		Francis, George B.	2, High Street, Islington
1857		Francis, George	23, Charlwood Seet, Belgravia
1841		Freeman, John	13, Blackfriars Road
1853		Freeman, Richard	5, Clayton Place, Kennington Road
1843		*Freeman, Robert	38, High Street, Kensington
1853		Gadd, Charles	1, New Bridge Street, Vauxhall
1842		Gale, Henry	3, Millbrook Place, Camden Town
1854	78	Gale, Samuel	338, Oxford Street
1841		Galliers, George	230, Tottenham Court Road
1841		Garden, Alexander	372, Oxford Street
1843		Garden, Felix R.	372, Oxford Street
1841		*Garle, John	12, Kensington Terrace
1858		Gedge, William Stedman	77, St. John Street
1850		*Gerard, Philip Augustus	390, Strand
1848		Gigner, John	King's Road, Chelsea
1843		Gill, George W.	15, Crown Place, Walworth
1842		Glover, George	19, Goodge Street
1841		*Gloyne, Charles	5, Terrace, Kensington
1842		Goddard, John D.	6, Arthur Street, City
1853		Golding, William	42, Upper Albany Street
1842		Goodbarne, Thomas	13, Charles Place, Charles Square
1842		Goodbarne, Thomas R.	Hornsey Road
1853		Goode, Thomas	47, Minories
1847		Goodger, David	31, Regent Street
1853		Goosey, William	5, Ocean Row, Stepney
1853		Gorton, John G.	144, High Street, Whitechapel
1854		*Gosden, Henry	140, Leadenhall Street
1856		Gould, John	Chicksand Street
1853		Gould, John Granger	198, Oxford Street [Wood
1853		Green, Josiah James	6, Henry St., Avenue Rd., St. John's
1847		Greenish, Thomas	20, New Street, Dorset Square.

Year of Membership.	No. of Certificate.	NAME.	ADDRESS.
1842		Griffiths, John	Clerkenwell Green
1853		Grisdale, John M.	216, Tottenham Court Road
1853		Gristock, Thomas	42, South Street, Manchester Square
1851		Gulliver, William	33, Lower Belgrave Street
1860	369	Guyer, James Brett	St. Michael's Alley, Cornhill
1853		Hackman, Leonard L.	41, Union Street, Bishopsgate Street
1853		Hall, John Heaton	10, Thornhill Square, Islington
1857		Hall, Robert	18, Wigmore Street
1841		Hanbury, Cornelius	Plough Court, Lombard Street
1841		*Hanbury, Daniel Bell	Plough Court, Lombard Street
1857		*Hanbury, Daniel	Plough Court, Lombard Street
1853		Harris, Daniel R.	55, St. James's Street
1852		Harvey, Edward	6, Giltspur Street
1855		Haselden, Adolphus F.	18, Conduit Street
1843		Hemingway, Walter	20, Portman Street
1842		Henly, John C.	213, Upper Thames Street
1853		Henty, Henry M.	87, High Street, St. John's Wood
1841		Herring, Thomas	40, Aldersgate Street
1841		Herring, William	40, Aldersgate Street
1841		Herring, Edward	Lombard Road, Battersea
1843		Hewitt, John	1, Wellclose Street, Wellclose Square
1842		Hewlett, Charles J.	Cree Church Lane
1852		Hickley, Thomas P.	125, Edgware Road
1842		Hill, Arthur S.	11, Little Britain
1853		Hill, Arthur B.	11, Little Britain
1853		Hillgenberg, Henry	38, Houndsditch
1848		Hills, Thomas H.	338, Oxford Street
1852		Hockin, John B.	38, Duke Street, Manchester Square
1848		Hodgkinson, Henry	3, Newland Terrace, Kensington
1852		Hogg, Robert	9, Albion Place, Hyde Park Square
1841		Hooper, William	24, Great Russell St., Covent Garden
1842		Hooper, William	7, Pall Mall East
1841		Hooper, Bartlett	43, King William Street, City
1841		Hooper, Hugh H.	22, Commerce Place, Brixton
1853		Hopkin, William K.	5, New Cavendish Street
1849		Hopkins, Thomas	34, Montague Square
1851		Hopkins, Thomas B.	Tulse Hill, Brixton
1853		Hora, Henry W.	58, Minories
1853	175	Horncastle, John	12, Stanhope Terrace
1841		Horner, Edward	20, Bucklersbury
1841		Horner, James T.	20, Bucklersbury
1859		Howden, Robert	78, Gracechurch Street
1856	412	Howell, Maurice	Peckham
1856	435	Howell, Thomas	61, North Place, Gray's Inn Road
1842		Hucklebridge, James M.	103, Upper Ebury Street
1841		Hudson, William B.	27, Haymarket
1843		Hughes, William P.	171, Hoxton Old Town
1853		Hugill, John	61, Cannon Street
1842		Humpage, Benjamin	44, Chancery Lane
1853	198	Hunt, William	Camberwell Green
1842		Huskisson, John	12, Swinton Street
1841		*Huskisson, William	12, Swinton Street
1853		Huskisson, Henry O.	77, Swinton Street
1848		Huxtable, John	104, St. John Street Road

Year of Membership.	No. of Certificate.	NAME.	ADDRESS.
1848		Huxtable, William	104, St. John Street Road
1853		Ingram, Robert	2, Queen's Terrace, St. John's Wood
1841		Jackson, John	47, Southampton Row
1853		Jamieson, John	49, Davies Street, Berkley Square
1855	298	Jefferson, Ebenezer W.	6, Finsbury Place South
1849		Jeynes, Edmund	49, Gt. James Street, Lisson Grove
1845		Jeynes, George W.	42, Princess Street, Edgware Road
1853		Jobson, Thomas C.	4, John's Row, St. Luke's
1853		Jolley, George	13, Curzon Street, Mayfair
1842		Jones, Peter	11, Norton Folgate
1849		Jones, Henry S.	Fulham Road
1841		Keating, Thomas	79, St. Paul's Churchyard
1842		Kemp, Robert	2, Queen's Place, Holloway
1842		Kemp, Richard	Upper Street, Islington
1859	325	Kendall, Charles Fisher	14, Old Dorset Place, Clapham Road
1841		Kent, Thomas	226, Blackfriars Road
1848		*Kernot, George	2, Chrisp Street, Poplar
1852	81	Kershaw, George	113, Park Street, Camden Town
1853		Kettle, Joseph	42, Castle Street East
1853		King, Robert	21, Princes Street, Hanover Square
1853		King, Charles T.	86, Snow Hill
1855	309	Kingdon, William Y.	6, Devonshire Terrace, Notting Hill
1853		Lacy, Benjamin W.	13, Westbourne Grove
1842		*Langton, Frederick C. R.	226, Upper Thames Street
1850		Large, John H.	2, Holt's Place, New North Road
1853		Laugher, Charles H.	Camden Town
1853		Lavers, Richard H.	28, Old Street Road
1856		Lawrence, Frederick	8, New Chapel Street, Kentish Town
1857	429	Lawrence, Henry	49, High Street, Kensington
1841		Lescher, Joseph S.	60, Bartholomew Close
1842		Lessey, John	97, High Street, Marylebone
1853		Lidwell, Joshua E.	46, High Street, Notting Hill
1853	260	Long, George	114, High Holborn
1853		Lovell, Frederick G.	37, Newington Crescent
1853		Lowe, William E.	8, Stafford Street, Bond Street
1841		*Luckombe, Charles	86, Snow Hill
1841		*Macmurdo, Edward	100, Upper Thames Street
1842		McCulloch, William	5, Coleman Street
1849		McCulloch, Charles	Covent Garden.
1849		Maitland, Alexander	8, Torrington Place, Torrington Sq.
1841		Maitland, John	10, Chester Place, Hyde Park
1853		Mansell, William	Plough Court, Lombard Street
1853		Marris, Joseph	37, Berners Street
1853		Marshall Thomas	2, Clayland's Place, Clapham Road
1853		Mason, John W.	45, Upper Marylebone Street
1853		Matland, George	10, Nassau Place, Commercial Road
1842		May, John	Battersea
1857		*Medlock, Henry	20, Great Marlborough Street
1842		Meggeson, George	61, Cannon Street
1853		Merrell, James	1, Queen's Terrace, Camden Villas
1855		Mitchell, John	12, Well's Row, Islington
1842		Moody, James	24, Church Street, Camberwell
1846		Moore, James L.	1, Craven Street, Westbourne Terrace
1841		*Mordaunt, John	Liverpool Road
1853		Morson, Thomas	19, Southampton Row

Year of Membership.	No. of Certificate.	NAME.	ADDRESS.
1841		*Morson, Thomas N. R.	Queen Square, Bloomsbury
1841		*Moscrop, Edward H.	140, Strand
1855		Mould, Samuel	21, Moorgate Street
1859	217	Mousell, Thomas	1, Berkeley Place, Connaught Terrace
1855	218	Mumford, George	5, Bathurst Street, Hyde Park
1853		Nicholls, John	1, Union Place, New Kent Road
1860	519	Nicholson, Frederick	St. Paul's Road, Highbury
1853		Northway, John	27, Great Tower Street
1853		Ogle, William H.	Battersea
1855		Oldfield, Henry	3, Radcliff Terrace, Goswell Road
1841		Orridge, Benjamin B.	30, Bucklersbury
1853		Palmer, Robert	33, Wilton Place, Belgrave Square
1853		*Parnell, George William	8, Fairfield Road, Bow
1842		Pasmore, James	5, Colville Terrace, Chelsea
1853		Pattison, George	126, St. John Street Road
1853		Peacock, Hamerton R.	170, High Street, Poplar
1841		Pedler, George S.	199, Fleet Street
1852		*Penrose, Arthur Wellesley	7, Amwell Street, Clerkenwell
1853		Pepper, John	1, Bedford Street, Bedford Square
1843		Peppin, Sydenham H.	25, Princes Street, Leicester Square
1859	538	Pettifer, Edmund Henry	6, Southgate Road
1854		Phillips, John	3, Vernon Place, Bagnigge Wells Rd.
1842		Philpot, Henry	32, Praed Street, Paddington
1843		Plummer, George	High Street, Peckham
1841		Pollock, Thomas	129, Fenchurch Street
1841		Portello, William	116, Denbigh Street, South Belgravia
1842		Potts, Robert U.	55, South Audley Street
1853		Power, John Henry	Denmark Hill
1846		Pratt, Edmund	1, Bloomsbury Square
1842		Preston, Joseph T.	94, Smithfield Bars
1852		Preston, Stanton W.	94, Smithfield Bars
1855	68	Quiller, Charles R.	15, Sloane Square
1859	397	Radermacher, Charles J.	2, New Cavendish Street
1841		Rea, Edward	115, Wardour Street
1853		Readman, Henry	18, Mortimer Street, Cavendish Sq.
1841		Redwood, Theophilus	19, Montague Street, Russell Square
1856		Reynolds, James John	3, Hanover Street
1854		Richards, James	40, New Bridge Street, Blackfriars
1845		Richardson, George	12, Norland Place, Notting Hill
1848		Ridsdale, James	1, Wakefield Terrace, Caledonian Rd.
1843		Roach, Pope	8, St. James's Street
1860	393	*Robbins, John	372, Oxford Street
1841		Rouse, Benjamin R. C.	9, Wellington Street, Southwark
1842		Rouse, Frederick J.	Clapham
1841		Rouse, Robert	1, Wigmore Street
1857	328	Rowntree, Thomas	2, Arundel Place, Islington
1859	415	Rowson, Henry	18, Chichester Street
1848		Sadler, William C.	13, Norton Folgate
1841		Sainsbury, Samuel	177, Strand
1843		Sandford, George W.	47, Piccadilly
1853		Schacht, William	38, Houndsditch
1843		*Sharpe, George Young	6, Kensington Terrace
1842		Sharwood, James Allan	98, Fenchurch Street
1841		*Shirley, John George	1, Westbourne Grove, Bayswater

Year of Membership.	No. of Certificate.	NAME.	ADDRESS.
1852		Simmons, Joseph	38, Lambeth Walk
1851	89	Sims, John F.	8, Hemingford Place, Barnsbury
1854		Skidmore, John	3, Charles St. West, Westbourne Ter.
1842		Slipper, James	86, Leather Lane
1847		Smith, William F.	12, Keen's Row, Walworth
1854		Snell, Glanville A.	3, Hampton Terrace, Hampstead Rd.
1842		Snelling, Francis	23, Farringdon Street
1843		Solly, Stephen F.	St. George's Circus, Southwark
1842		Southwood, Thomas S.	Harrow Road
1841		*Squire, Peter	277, Oxford Street
1841		Squire, William	5, Coleman Street
1841		Starkie, James	4, Strand
1858	147	Stathers, John	43, Norland Road, Notting Hill
1849		Stead, John M.	213, Upper Thames Street
1842		Steer, Philip R.	Church Street, Hackney
1854	97	Stocken, James	112, Drummond Street, Euston Sq.
1850		Stuart, John E.	172, New Bond Street
1853		Summers, James R.	43, Curtain Road
1841		Swire, Roger	14, Edgware Road
1854		Swire, George	Brixton Hill
1854		Taylor, John	77, Hackney Road
1853		Thomas, Henry	7, Upper St. Martin's Lane
1851		Thomas, Richard W.	10, Pall Mall
1855		Thomas, John Jabez	Stoke Newington
1845		Thompson, Henry A.	86, Chiswell Street
1857	372	Tibbs, Frederick	47, Blackfriars Road
1841		Tippett, Benjamin M.	3, Sloane Street
1841		Tonge, George	213, Upper Thames Street
1842		Towerzey, Alfred	20, Marylebone Street
1857	61	Trask, Thomas	14, Albany Street
1853		Tupholme, John T.	38, Lamb's Conduit Street
1859	222	Turner, Charles E.	63, Great Russell Street, Bloomsbury
1853		Turner, Richard	2, Oxendon Street, Haymarket
1853		Tustin, Thomas H.	London Hospital
1842		Twinberrow, William	2, Edward Street, Portman Square
1852	90	Urwick, William W.	33, Denbigh Place, Pimlico
1853		Vint, James	3, High Street, Bow
1857	357	*Vizer, Edwin B.	63, Lupus Street, Pimlico
1841		*Wagstaff, John Henry	James Street, Westbourne Terrace
1842		Walker, Alexander	10, Ireland Row, Mile End
1842		*Walker, Henry	35, Skinner Street, Somers Town
1844		Waller, Arthur	6, Middleton Square
1845		Ward, Francis	14, Grosvenor Street
1846		*Warner, Charles Heath	55, Fore Street
1844		Watts, William	3, Gray's Place, Brompton
1853		Watts, William M.	32, Whitecross Street
1853		Watts, Peter	6, Sol's Row, Hampstead Road
1856	110	Watts, Henry T.	11, Victoria Road, Pimlico
1841		Waugh, George	177, Regent Street
1853		Wegg, William	10, North Place, Ball's Pond
1842		Westwood, William H.	16, Newgate Street
1842		Westwood, Robert	16, Newgate Street
1854	321	Wheeler, Christopher	56, Hackney Road

Year of Membership.	No. of Certificate.	NAME.	ADDRESS.
1853		*Whitburn Augustus R.	174, Regent Street
1841		White, John	228, Piccadilly
1841		White, Daniel	19, Park Terrace, Regent's Park
1852		White, Edmund	19, Park Terrace, Regent's Park
1842		Wilkes, George	1, Hayfield Place, Mile End
1853		Wilkinson, William	114, Lambeth Walk
1851		Williams, John	5, New Cavendish Street
1857	363	Williams, Thomas	2, Hereford Terrace, Bayswater
1844		Willmott, William	83, High Street, Southwark
1857		Willows, John	101, High Holborn
1853		Wilson, Thomas	Upper Holloway
1853		Windle, William	48, Portman Place
1842		Wooldridge, John	19, Bath Place, New Road
1855	364	*Wrangham, John	3, Acre Lane, Brixton
1859		Wright, George Henry	7, Poultry
1853		Wright, William V.	11, Old Fish Street
1842		Wyman, John	122, Fore Street
1858	294	*Yarde, Giles	28, Lamb's Conduit Street
1842		Yates, Benjamin	25, Budge Row, Cannon Street
1859	443	*Yates, Francis	100, Upper Thames Street
1852		Young, Frederick	137, Minories
1853		Young, George	12, Ebenezer Terrace, Mill Wall
1859		Young, William Herbert	35, Baker Street

COUNTRY MEMBERS.

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1846		Abbott, John Thomas	Darlington
1853		Abraham, John	Liverpool
1852		Ackerman, Theophilus	Bristol
1845		Ackrill, George	Abergavenny
1847		Acton, George	Worcester
1853		Adams, John	Loughborough
1853		Adams, Jonathan Henry	Stoke-on-Trent
1853		Adkins, Henry James	Birmingham
1849		Ainslie, William	Edinburgh
1852		Aitken, William	Edinburgh
1849		Albright, Henry	Liverpool
1853		Alderton, John	Hastings
1853		Aldridge, Alexander John	Brighton
1852		Alexander, James	Greenock
1848		Allanson, Charles	Harrogate
1847		Allen, Thompson	Boston
1853		Allen, Adam U.	Lymington
1859	555	*Allen, James Hore	Tottenham
1853		Alpass, Horace S.	Liverpool
1846		Althorp, James	Stamford
1858	400	Amos, Daniel	Canterbury
1852		Anderson, James	Musselburgh
1853		Anderson, Charles Thomas	Jersey
1841		Anderson, Duncan S.	Edinburgh
1853		Andrew, William	Aberdeen
1841		Andrews, John Betts	Clare
1853		Andrews, Thomas William Cox	Norwich
1854	375	*Anness, Samuel Richard	Ipswich
1841		Anthony, Jacob	Bedford
1853		Appleby, William H.	Stockport
1853		Archer, Thomas	Southam
1841		Argles, Henry	Maidstone
1858	268	Argles, John	Maidstone
1841		Armstrong, Henry	Preston
1853		Arnold, Adolphus	Guernsey
1841		Arnold, Edward	Norwich
1842		Arthy, Joseph	Peterborough
1853		Ash, James Freer	Wiveliscombe
1853		Ashton, John Swan	Leicester
1853		Ashton, William	Southport
1853		Aslin, John	Sunderland
1846		Asling, Brelsford	Spalding
1855		Astley, John	Coventry
1859	457	*Atherton, John Henry	Nottingham
1846		Atkins, Francis Thomas	Woolwich
1842		Atkins, Francis Thomas	Deptford
1853		Atkins, Samuel Ralph	Salisbury
1853		Atkinson, Richard Marshall	Leeds
1842		*Atkinson, Stephen	Doncaster
1855	420	*Atkinson, Matthew	Manchester
1842		Attwood, George	Brompton

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1850		Aubin, James	Jersey
1853		Backhouse, William	Leeds
1844		Badcock, John	Barnard Castle
1852		Baildon, William	Edinburgh
1841		Baildon, Henry C.	Edinburgh
1853		Bailey, Richard	Penrith
1841		Bailey, William	Wolverhampton
1858	431	Bailey, Richard	Winchester
1845		Baines, Richard	Blackburn
1841		Baker, William	Chelmsford
1850		Baker, Charles Patrick	Chelmsford
1852		Baker, William	Brentford
1842		Baker, William	Retford
1859	556	*Baker, Alfred Philip	Lewisham
1855	391	*Balkwill, Frederick Pryor	Plymouth
1844		Ball, George Vincent	Banbury
1841		Ball, Joseph	Liverpool
1842		Ballard, William	Abingdon
1842		Ballard, Edwin	Farringdon
1850		Balls, George	Deptford
1845		Bally, Edward F.	Baldock
1841		Baly, Henry	Warwick
1859		Baly, James	Warwick
1848	12	Bancroft, John James	Ruthin
1859		Banfield, Harold	Bury St. Edmunds
1841		Banks, Morris	Birmingham
1859	484	*Banner, Samuel	Liverpool
1853		Barber, George	Liverpool
1845		Barclay, John	Falmouth
1853		Bard, William F.	Ixworth
1842		Barker, William Henry	Biggleswade
1853		Barker, Joseph	Sudbury
1846		Barling, Thomas	Weymouth
1853		Barlow, Samuel	Darlington
1841		Barnes, James	Preston
1850		Barnett, William	Brighton
1853		Barnish, Edwin H.	Wigan
1853		Barritt, George	Croydon
1849		Barron, William	Cheltenham
1842		Barry, George	Northampton
1853		Barry, Edwin	Northampton
1853		Barry, James	Northampton
1853		Barstow, Charles H.	Spofforth
1847		Barton, Henry	Brighton
1853		Barton, Charles	Brighton
1852		Barton, William	Campbeltown
1842		Bass, William Thomas	Enfield
1846		Bassett, Charles	Pontypridd
1853		Batchelor, Charles	Fareham
1853		Bateman, John Bird	Manchester
1852		Bates, John	Bicester
1850		Bates, William I.	Macclesfield
1853		Bath, Richard C.	Morice Town
1841		Baumborough, William	Wandsworth

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1855	207	Baxter, William Walmsley	Bromley
1841		Baynes, James	Hull
1858		Baylis, Thomas	Worcester
1847		Beadon, John	Taunton
1852		Beard, James	Manchester
1842		Beardsley, John	Nottingham
1853		Beaumont, William H.	Gravesend
1847		Beckett, John	Scarborough
1846		Beech, Joseph	Atherstone
1841		Beesley, Henry	Banbury
1844		Beesley, Thomas	Banbury
1851		Bell, William	Carlisle
1853		Bell, Edward C.	Dudley
1857	280	Bell, James	Manchester
1857		Bell, Francis	Bradford
1841		Bennet, William	Bath
1842		Bennett, George	Newark
1850		Bennett, John W.	Leigh, Lancashire
1853		Bentham, Thomas	Southsea
1853		Berry, Henry James	Worthing
1847		Berry, Edward	Gloucester
1853		Bettison, Joseph	Chesterfield
1854	365	Betts, George William	Spalding
1853		Betts, John	Woodbridge
1847		Bevan, Charles F.	Harwich
1853		Bew, Robert	Bilston
1842		Biggs, Robert	Bath
1852		Bingley, Thomas Gyles	Manchester
1853		Binns, Samuel	Sheffield
1848		Binsley, James	Edinburgh
1842		Birch, Thomas Edwards	Mold
1850		Bird, Ash Rudd	Ipswich
1842		Bird, Charles	Worcester
1841		Bishop, Robert	Eye
1849		Bishop, Thomas	Woolwich
1853		Black, James	Leven
1842		Blackburn, Bailey	Bradford
1852		Blacklock, Henry	Bournemouth
1841		Blacklock, Joseph D.	Brighton
1845		Blackshaw, Thomas	Burslem
1842		Blades, Christopher	Leek
1846		Blades, Holland	Nantwich
1842		Blades, Sherriff	Northwich
1856		Blake, William F.	Stroud
1853		Blamires, Samuel	Bradford
1857		Bland, John Handel	Stourbridge
1852		Blanshard, George	Edinburgh
1853		Blanshard, Thomas	Edinburgh
1848		Bloor, Joseph	Derby
1853		Blunt, Thomas	Shrewsbury
1842		Boast, Thomas	York
1842		Bolton, Thomas	Tenterden
1853		Bond, Laurence V.	Tiverton
1842		Bond, John	Great Yarmouth

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1850		Bond, Charles	Kidderminster
1842		Bond, John	Minehead
1848		Boocock, John	Leeds
1852	116	Boorne, Charles	Bristol
1853		Booth, James	Blackburn
1853		Booth, Thomas Buckley	Eccles
1842		Booth, John	Heckmondwicke
1853		Booth, Aaron	Manchester
1841		Booth, James	Rochdale
1858	499	*Booth, Henry	Rochdale
1853		Booth, Nathaniel	Rotherham
1859	332	Borland, John	Kilmarnock
1853		Bostock, William	Ashton-under-Lyne
1855	304	Botham, William	Manchester
1842		Bottle, Alexander	Dover
1849		Bowen, Henry F.	Rottingdean
1841		Bowerbank, Joseph	Cockermouth
1853		Bowerbank, Fawcett	Cockermouth
1843		Bowers, Thomas	Chester
1847		Bowers, James D.	Chester
1853		Bowker, James	Manchester
1853		Bowles, Charles A.	Chester
1858	29	Bowman, William	York
1853	257	*Boyce, John Pierce	Windsor
1841		Boyce, John Pierce	Chertsey
1842		Braddock, William	Oldham
1856	411	*Brady, Henry B.	Newcastle-on-Tyne
1853		Bragg, William B.	Market Harborough
1842		Brailey, Charles	Heavitree
1849		Bramwell, George	Liverpool
1853		Brandreth, Lawrence	Preston
1842		Brayshay, William Bolam	Stockton
1842		Brearey, William A.	Douglas
1846		Bremner, William	Thurso
1845		Brend, Thomas	Swansea
1852		Brereton, John	Manchester
1858	272	Breton, Walter	Brighton
1858	428	*Brevitt, William Y.	Wolverhampton
1842		Brew, Thomas Archer	Brighton
1842		Brewster, William	Cambridge
1853		Brierley Richard	Stalybridge
1842		Briggs, James	Tipton
1843		Bright, Philip	Brecon
1850		Brimelow, Thomas	Farnworth
1842		Brocklehurst, James	Hyde
1853		Bromfield, William	Crewe
1853		Bromfield, Charles	Exeter
1848		Bromley, Charles	Liverpool
1853		Brothers, William	Folkestone
1842		Brown, Charles	Belper
1853		Brown, Thomas Dudley	Coventry
1846		Brown, William	Dunfermline
1844		Brown, John	Eccles
1852	121	Brown, David R.	Edinburgh

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Brown, Thomson	Glasgow
1853		Brown, Alfred James	Halstead
1850		Brown, Thomas	Lutterworth
1845		Brown, William Scott	Manchester
1853		Brown, George	Selby
1853		Brown, Samuel	Coningsby
1847		Bryant, William	Huntingdon
1853	226	Bryce, James	Dunfermline
1853		Buck, Richard C.	Dudley
1853		Bullus, William	West Bromwich
1853		Bunn, Charles	Colchester
1842		Burdon, John	Durham
1848		Burdwood, James	Plymouth
1851		Burgess, William	Northwich
1853		Burnett, Robert	Frazerburgh
1853		Burrell, George	Montrose
1852		Burrow, Walter B.	Great Malvern
1853		Burrow, John Severn	Great Malvern
1853		Bustin, William	Shotley Bridge
1852		Butcher, Thomas	Cheltenham
1841		Butler, Samuel	Bristol
1841		Butler, William	Wycombe
1853		Butler, Thomas E.	Leicester
1841		Butterfield, James M.	York
1853		Butterworth, Isaac	Ashton-under-Lyne
1849		Bwye, George	Cheshunt
1853		Caddick, John	Newcastle-under-Lyne
1853		Caley, Albert Jarman	Norwich
1849		Calvert, Robert	Stokesley
1842		Calvert, James	Belper
1846		Campbell, Donald	Glasgow
1853		Campbell, Edward D.	Sunderland
1852	122	Carmichael, Lauchlan	Edinburgh
1842		Carr, William	Leicester
1841		Carr, William Graham	Berwick
1844		*Carran, Thomas	Peel, Isle of Man
1853		Carruthers, Richard Birrell	Dumfries
1850		Carter, William	Manchester
1844		Cartwright, William	Newcastle-under-Lyne
1852		Cattle, James	Liverpool
1849		Cave, Thomas	Maidstone
1853		Chamberlin, William	Downton
1842		Chantry, George	Goole
1855	62	Chaplin, John Lambert	Colchester
1846		Chaplin, Alfred	Brighton
1849		Chapman, Richard J.	Chipping Ongar
1853		Chapman, Henry	Clifton
1841		Chapman, John Cook	Congleton
1842		Chapman, Edward	Hull
1853		Chapman, William Fox	Hull
1853		Chapman, William	Ipswich
1853		Chapman, Henry	Ipswich
1853		Chapman, John	Tring
1853		Chapman, William	York
1851		Chaston, Robert	Lowestoft
1841		Chater, Jonathan	Watford

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Chaundy, Thomas G.	Oxford
1842		Chave, John Anstey	Uxbridge
1849		Cheshire, John	Grantham
1853		Childs, James L.	Southsea
1853		Childs, Joseph L.	Portsmouth
1842		Chipperfield, Robert	Southampton
1859	487	*Chrispin, William	Ripon
1851		Christian, Francis	Birmingham
1842		Christopher, William	Crickhowell
1853		Churchill, John	Birmingham
1856		Churchouse, William B.	Chard
1855	334	Clark, William W.	Dorking
1853		Clark, Robert	Devizes
1853		Clarke, Benjamin Joseph	Cheltenham
1847		Clarke, William	Durham
1845		Clarke, John Webster	Leicester
1853		Clarke, William	Longsight
1846		Clarke, Thomas Meadows	Richmond
1841		Clarke, Joseph	York
1860	200	Clarke, William R.	Northampton
1853		Clater, Francis	Retford
1841		Clay, Robert	Liverpool
1854	201	Clayton, John Oates	Leeds
1853		Clennell, John Morton	Newcastle-on-Tyne
1853		Clift, Joseph	Dorking
1849		Clift, Edward	Lewisham
1845		*Coates, William	Leeds
1858		Coates, John M.	Newcastle
1853	123	Cobb, John S.	Yarmouth
1852		Cochrane, Thomas	Falkirk
1853		Cock, John	Shipdham
1842		Cocking, George	Ludlow
1853		Cockton, John	Maryport
1841		Colbeck, George Royde	Leamington
1848		Cole, Walter Thomas	Weymouth
1859		Collier, William Lindsey	Reading
1853		Collier, William	Sheffield
1846		Collier, William	York
1849		Collings, William Henry	Bristol
1852		Colton, Thomas	Selby
1853	185	Conacher, David	Markinch
1853		Constable, Edwin	Birkenhead
1842		Conway, William	Pontypool
1847		Cooling, John	Newark
1843		Cooke, William	Norwich
1845		Cooper, Mark Ward	Bridlington
1850		Cooper, George Brown	Brightlingsea
1852		Cooper, James Robert	Birmingham
1841		Cooper, James Newbury	Clifton
1841		Cooper, George	Exeter
1841		Cooper, Thomas	Leicester
1853		Cooper, Lewis	Reading
1845		Cooper, Thomas	York
1853		Corfield, Thomas J. T.	St. Day
1843		Cornelius, Richard Bussell	Teignmouth

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1859	469	*Cornell, William	Stowmarket
1845		Cornish, Henry Robert	Penzance
1843		Cornish, William	Brighton
1841		Corrie, Charles	Bedford
1841		Cortis, Charles	Worthing
1853		Cottee, William	Salford
1853		Cotterell, William Henry	Dover
1841		Cotton, Gilbert Knill	Barnstaple
1853		Coupland, Henry	Liverpool
1853		Coupland, Joseph	Harrogate
1842		Cousins, Thomas George	Oxford
1841		Cousins, John Rose	Dorking
1842		Coverley, John	Scarborough
1845		Cowell, Silas	Canterbury
1845		Cowgill, Brian	Burnley
1841		Crafton, Ralph Caldwell	Croydon
1853		Crarer, John	Blairgourie
1842		Craske, Samuel	Holt
1853		Crick, George Edward	Maldon
1853		Cripps, John	Hammersmith
1842		Critchley, John	Blackburn
1842		Crocker, Henry Radcliffe	Brighton
1853		Crofts, Holmes Cheney	Chatham
1852	124	Croley, William	Edinburgh
1842		Cronshey, James	Thetford
1841		Crook, George	Farnham
1841		Cropper, James	Long Sutton
1853		Croskell, Charles	York
1858	432	*Cross, William	Cardiff
1847		Cross, William Gower	Shrewsbury
1853		Crowder, Charles H.	Barton-on-Humber
1846		Crowther, Thomas	Tickhill
1851		Cuff, Robert C.	Bristol
1852		Cumbers, John	Wandsworth
1853		Cumine, Frederick H.	Southport
1841		Cupiss, Francis	Diss
1853		Currie, John	Glasgow
1854	273	Cuthbert, John Mason	Bedford
1842		Cutting, James Bray	Leamington
1848		Cutting, Thomas	Selby
1853		Cutts, Thomas	Basford
1842		Dale, George	Chichester
1844		Dale, William James	Portsea
1855		Dance, William D.	Stourport
1853		Dandie, David	Perth
1855	126	Dandie, Robert	Perth
1850		Davenport, Edward	St. Alban's
1846		Davidson, John	Berwick
1853		Davidson, Charles	Aberdeen
1842		Davies, Richard Morgan	Carmarthen
1853		Davies, Thomas	Cheltenham
1853		Davies, John L.	Hay
1853		Davies, Peter Hughes	March
1853		Davies, William Henry	Pillgwinlly
1841		Davis, John	Dorchester

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1841		Davis, Robert	Dorchester
1859	282	Davis, Richard Hayton	Harrogate
1856		Davis, D. Frederick	Leominster
1841		Davis, Henry	Leamington
1842		Davis, Francis	Newbury
1848		Davis, John Oliver	St. Leonards
1845		Davison, Ralph	York
1842		Davy, Henry	Wiveliscombe
1854		Dawe, Sampson	Monmouth
1853		Dawson, Thomas	Preston
1853		Day, George	Blackheath
1853		De Bois, Frederick	Glasgow
1853	194	Deck, Arthur	Cambridge
1845		Dennison, Matthew	Dudley
1853		Densham, John B.	Plymouth
1852		Dewar, Peter James	Dingwall
1842		Dexter, James	Eastbourne
1842		Dickerson, Henry	Devonport
1845		Dickins, Rowland	Aylesbury
1847		Dingley, Richard Loxley	Evesham
1853		Dixon, Benjamin	Norwich
1858	460	*Dixon, Henry	Ryde, Isle of Wight
1854	381	*Dixon, William	Southampton
1842		Dobinson, William	Sunderland
1853		Dobson, James	Keswick
1858		Dobson, John	Newcastle-on-Tyne
1847		Dodman, Robert	Thorney
1842		Dodshon, Edward...	Sunderland
1852		Done, John	Manchester
1846		Doubell, James	Rayleigh
1855		Doughty, Richard	Bushey
1842		Dowell, William Cuming	Bristol
1845		Dowman, George	Southampton
1847		Down, Richard Haydon	Torpoint
1853		Downes, Joseph	Lower Mitcham
1847		Downing, Joseph	Braintree
1852		Dowthwaite, William	Barnet
1841		Drage, William F.	Birmingham
1841		Dresser, Richard	York
1842		Dron, William	Kirkcaldy
1841		Duck, Daniel	Guisborough
1846		Dudden, Richard M.	Midsomer Norton
1852		*Dudgeon, George	Nottingham
1842		Duggan, Henry	Hereford
1853	184	Duncan, William	Rothesay
1841		Duncan, John	Edinburgh
1842		Duncan, Frederick MacRae	Sandwich
1842		Dunhill, William	Doncaster
1853		Duprey, Jean A. B.	Jersey
1853		Durant, Frederick	Dorking
1853		Durant, Edmund	Dorking
1847		Dutton, John	Birkenhead
1842		Dutton, George	Bolton
1853		Dyer, John	Margate

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1842		Dyer, Thomas	Exeter
1853		Dyer, William	Halifax
1842		Dyson, John	Andover
1853		Eastes, Thomas Henley	Dover
1853		Edgar, James	Henley-on-Thames
1859	324	Edman, Bonner	Henley-on-Thames
1853		Edmonds, Benjamin M.	Lowestoft
1842		Edwards, George	Dartford
1853		Edwards, William	Denbigh
1853		Edwards, James	Leicester
1850		Edwards, Henry	Lincoln
1848	22	*Edwards, John Baker	Liverpool
1853		Edwards, William	Sidmouth
1853		Ekins, William	Huntingdon
1842		Eliott, Samuel	Liskeard
1842		Ellaby, John	Melton Mowbray
1842		Ellis, Benjamin	Shepton Mallett
1853		Ellis, William	Abergele
1849		Ellis, Richard	Thornbury
1859		Ellwood, William	Dublin
1845		Elsey, John	Horncastle
1856	258	*Elsey, Charles	Boston
1847		Ely, George	Bingham
1843		*England, William Paul	Huddersfield
1848		Ereaut, John	Jersey
1853		Ereaut, George	Jersey
1860	553	*Ereaut, John, Jun.	Jersey
1860	493	Essery, William	Plymouth
1858	211	Evans, Evan	Aberavon
1847		Evans, Thomas	Aberdare
1853		Evans, Samuel	Caerphilly
1853		Evans, William Luke	Cardiff
1842		Evans, John	Hemel Hempstead
1851	43	Evans, Thomas	Liverpool
1842		Evans, Edward	Liverpool
1854	47	Evans, Henry S.	Liverpool
1842		Evans, Thomas B.	Liverpool
1853		Evans, John	Narberth
1853		Evans, William Downing	Newport, Monmouth
1842		Eyre, Alfred B.	Ipswich
1842		Eyre, Thomas S.	Launceston
1844		Fairbank, James Hack	Woolwich
1853	361	Fairbarn, George	Liverpool
1853		Fairley, Thomas	Sunderland
1853		Falkner, Richard	Banbury
1853		Farie, Gilbert	Bridge of Allan
1842		Farmer, John	Putney
1853		Farnworth, William	Blackburn
1853		Farrage, Robert	Rothbury
1850		Farrant, Henry	Ottery St. Mary
1842		Farrant, Robert	Salisbury
1843		Farrant, John G.	Brentford
1854	99	Farrer, John Daniel	Chester
1853		Farrow, William	Woburn

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1842		Fergusson, John	Liverpool
1842		Fielder, Thomas	Warminster
1842		Finch, John	Cheltenham
1852		Finlayson, Thomas	Leith
1851		Fisher, John Thornhill	Torquay
1853		*Fisher, Henry Christopher	Torquay
1853		Fiske, Charles	Ipswich
1843		Fitch, Robert	Norwich
1842		Fitt, Edward	Barking
1841		Fleeming, William	Wolverhampton
1842		Fletcher, Francis	Cheltenham
1841		Flockhart, William	Edinburgh
1853		Flower, Thomas S.	Matlock-Bath
1842		Foggitt, Thomas Jackson	Thirsk
1841		Forbes, William	Reigate
1853		*Forge, Christopher	Bridlington
1853		Forman, George	Birmingham
1853		Forrest, Richard William	Gainsborough
1853		Forster, John	Whitehaven
1845		Forster, Robert	Dover
1853		Forsyth, William	Aberdeen
1841		Foster, Frederick	Brighton
1853		Foster, Alfred Hood	Birmingham
1845		Foster, James Fawcett	Hull
1842		Foster, Edward	Ludlow
1855		Foster, George Pitt	Tetbury
1853		Foster, John	Uckfield
1842		Foulds, William	Chowbent
1859	421	*Fouracre, Robert	Taunton
1846		Fowke, George	Stafford
1853		Fowler, Edward	Bedale
1853		Fowler, Henry	Torrington
1849		Fox, Charles James	Witney
1853		Foxcroft, Elijah	Skipton
1853		Franks, Alfred	Ramsgate
1853		Fraser, Charles	Largs
1853		Frazer, Daniel	Glasgow
1853		Freeland, John	Barrhead
1844		Freestone, Thomas Morris	Bristol
1841		French, Gabriel	Chatham
1853		Fresson, Lewis Francis	Stevenage
1851		Frost, William Henry	Collumpton
1841		Fryer, Henry	Huddersfield
1849		Furmston, Samuel C.	Wycombe
1853		Gall, Benjamin D.	Woodbridge
1842		*Gamble, Richard	Grantham
1853		Gammidge, Samuel	Leicester
1841		Garbutt, Cornelius	Gateshead
1853		Garbutt, Cornelius D.	Gateshead
1842		Gardener, Charles	Tunbridge Wells
1841		Gardner, James	Edinburgh
1846		Garlick, Thomas H.	Halifax
1853		Garlick, John	Hollinwood

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Garnett, Joseph	Newcastle-on-Tyne
1851		Garnham, Barrington	Brighton
1842		Garratt, John Colpman	Rugby
1856		Garratt, Samuel	Rugby
1842		Garside, F. Burdett	Southport
1842		Gay, George	Stroud
1853		Geake, John	St. Columb
1846		Geldard, John	St. Austell
1842		Geldard, Richard Kelly	Plymouth
1853		Gerrard, Joseph	Longton
1841		Gibbons, William	Plymouth
1852		Gibbs, William	Ryde
1851		Gilbert, George	Portsea
1847	37	*Giles, Richard William	Clifton
1841		Giles, Richard Bobbet	Clifton
1842		Gill, Samuel	Pendleton
1842		Gill, William	Tavistock
1859	471	*Gill, Hugh	Halifax
1853		Gillman, Thomas Rice	Newport, Monmouth
1841		Gilkes, William	Leominster
1856	433	Gissing, Thomas W	Wakefield
1844		Glaisby, John	York
1841		Glaisyer, Thomas	Brighton
1852	71	Glanfield, George	Torquay
1853		Glasier, Samuel	Manchester
1859	458	*Glass, John T.	Cheltenham
1853		Glew, William	Selby
1850		Glover, Samuel	Liverpool
1841		Gloyne, Thomas Hadfield	Dewsbury
1858		Glyde, John William	Blandford
1848		Goadsby, Thomas	Manchester
1842		Goddard, Joseph	Leicester
1842		Goodall, Thomas	Ensham
1850		Goodall, Henry	Derby
1841		Goode, Thomas	Congleton
1857	79	Goode, Charles	Congleton
1857		*Goodwin, John	Lower Clapton
1842		Gordelier, Paul William Gibbs	Sittingbourne
1853		Goss, Samuel	Barnstaple
1853		Gostling, Thomas P	Diss
1853		Gould, Frederick	Kingston-on-Thames
1855		Govan, Alexander	St. Andrews
1841		Gow, Alexander	Wolverhampton
1857		Granger, Edwin John	Upper Clapton
1852	130	Gray, Alexander F.	Edinburgh
1852	131	Gray, John	Cupar Angus
1848		Gray, William	Rothwell
1853		Gray, Charles	Bilston
1853		Greaves, Abraham	Ironville
1844		Greaves, John	Bakewell
1842		Greaves, Richard	Ripon
1853		Green, Robert Poynton	Witham
1853		Green, George	Selby
1848		Green, John	Birkenhead

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Green, William M.	Liverpool
1854	245	Green, James	Droitwich
1853		Greenough, George	Manchester
1849		Greenwell, William C.	Gateshead
1848		Greenwood, John	Harrogate
1853		Greig, William	Glasgow
1852		Griffith, Robert	Carnarvon
1844		Griffith, Charles	Weston-super-Mare
1846		Griffith, Richard	Slough
1853		Griffiths, John	Narberth
1853		Griffiths, William	Swansea
1855	18	*Grindley, Robert D.	Chester
1853		Groom, William Bishop	Liverpool
1852		Grounds, George Field	Bishop Stortford
1842		Grounds, Ambrose	Ludlow
1854	95	Groves, Wellington E.	Blandford
1853	103	Groves, Thomas Bennett	Weymouth
1853		Groves, Edward	Hammersmith
1852		Grundy, Edwin	Lenton
1853		Gudgen, George B.	Kimbolton
1842		Gulliver, Walker Job	Lutterworth
1842		Gundry, William	Bristol
1842		Gunner, George	Winchester
1841		Gurnell, Thomas	Dartford
1846		Guy, Guy	Helston
1841		Gwatkin, James Thomas	Brighton
1852		Gwillim, John Cole	Newport, Monmouth
1853		Hadfield, John	Congleton
1841		Hadfield, William	Congleton
1853		Hadfield, William P.	Newark
1852		Haigh, Joseph	Leeds
1842		Haines, John Jenkins	Bromsgrove
1853	182	Hains, Parton John	Highgate
1843		Hall, Joseph	Salford
1852		Hall, Thomas	Newcastle-on-Tyne
1853		Hall, Richard	Brecon
1853		Hall, Robert	Camborne
1852	4	Hall, John Richard	Canterbury
1849		Hall, Thomas	Grantham
1842		Hall, George	Huddersfield
1853		Hall, Henry R. F.	Hull
1842		Hall, John Dean	Wycombe
1849		Hallam, Edward	Axbridge
1859	536	Hallaway, John	Carlisle
1860	434	Halliday, William Jabez	Manchester
1842		Hallsworth, Thomas	Manchester
1853		Ham, John	Nether Stowey
1841		Hambrook, Odden	Dover
1857		Hambrook, John B.	Dover
1853		Hamilton, Julius	Poole
1858		Hamilton, John T.	Dublin
1846		Hammon, Richard	Folkestone
1855	383	Handley, John	Wakefield
1853		Hannell, Edward W.	Rugby

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853	230	Hardie, James	Dundee
1853		Harding, James John	Sudbury
1853		Hardman, Thomas B.	Liverpool
1853		Hare, Josiah William	Harleston
1852		Hargreaves, Henry L.	Oldham
1842		Harold, William ..	Battle
1842		Harper, Henry	Leamington
1853		Harrington, Richard B.	Honiton
1852		Harrington, Arthur	Rochford
1854	203	Harris, William Harry	Northampton
1853		Harrison, Thomas	Leeds
1842		Harrison, Thomas	Bradford
1842		Harrison, James Parker	Carlisle
1847		Harrison, John	Nottingham
1847		Harrison, Thomas	Nottingham
1842		Harsant, William	Epsom
1848		Hart, James	Bolton
1852		Hart, Hugh	Glasgow
1853		Hart, George William	Hull
1841		Hartland, James	Bristol
1853		Hartley, Robert	Manchester
1853		Hartshorn, William H.	Ironbridge
1841		Harvey, Thomas	Leeds
1843		Harvey, John	Newark
1842		Haselar, Albert	Cranbrook
1848		Hatfull, Robert	Deptford
1853		Hatrick, Robert	Paisley
1853		Hatrick, William	Paisley
1853		Hawkins, Henry Ford	Rugeley
1841		Hawxby, Thomas	Tottenham
1847		Haydon, Frederick Walter	Fordingbridge
1842		Haydon, Henry William	Tiverton
1857	447	*Hayes, James	Great Warley, Essex
1853		Hayman, Alfred	Neath
1853		Hayward, Samuel H.	Gloucester
1845		Hayward, William G.	Reading
1845		Hayward, Edward	Ipswich
1853		Hayward, Charles	Manchester
1859	541	*Hayward, Charles John	Lincoln
1847		Hazell, Robert W.	Maidstone
1842		Head, John	Lewes
1842		Headley, Morris	Bridlington Quay
1846		Heald, William	Sleaford
1841		Heath, Edward	Cromer
1845		Heathcote, Thomas Sarl	Newcastle-under-Lyne
1847		Heaton, John Scholes	Manchester
1853	285	Heming, Robert	Sunderland
1842		Heming, Richard George	Worcester
1848		Hempsted, Robert	St. Leonards
1853		Henderson, John	Glasgow
1853		Henley, Henry	Lyme Regis
1853		Henshall, John	Congleton
1853		Hensleigh, Henry	Plymouth
1841		Henson, Matthew	Dunstable
1853		Henthorn, Joshua	Oldham

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Herington, Joseph	Leighton Buzzard
1845		Hern, William Henry	St. Austell
1853		Hewett, William Henry	Great Yarmouth
1853		Hewlins, Edward	Leatherhead
1842		Hibbert, Walter	Neath
1845		Hick, Matthew Bussey	Wakefield
1846		Hick, Allan	Wath
1845		Hick, Joseph	Bradford
1842		Hickman, Joseph Frederick	Newbury
1852		Hicks, Robert	Lerwick
1853		Hicks, George	Rothesay
1853		Hifley, Richard James	Devonport
1853	96	Higgins, Thomas S.	Huddersfield
1843		Higgins, William	Chester
1842		Higgs, John Seagrave	Market Harborough
1842		Highway, Henry	Walsall
1853	192	Hill, Charles William	Burnley
1842		Hill, Richard	Bruton
1854	246	Hill, Thomas	Norwood
1853		Hill, William	Manchester
1853		Hill, Simon	Plymouth
1841		Hill, John	Sheffield
1853		Hinchcliffe, Ferrand G. U.	Manchester
1853		Hincks, Thomas R.	Chester
1853		Hinds, James	Coventry
1853		Hine, Alfred	Beaminster
1858		Hingston, Andrew H.	Liverpool
1842		Hitchcock, Charles Edmund	Colchester
1842		Hitchcock, William Richards	Taunton
1853		Hobson, Charles	Beverley
1847		Hodder, Henry	Bristol
1853		Hoddy, Benjamin	Halstead
1852	133	Hodgeton, David	Brechin
1841		Hodgson, Edward	Stockton
1853		Hodkinson, Henry	Macclesfield
1853		Hogg, Henry	Bristol
1853		Hogg, Thomas	Bideford
1853		Holden, Richard	York
1853		Holdsworth, Thomas W.	Birmingham
1854		Holland, William	Market Deeping
1841		Hollier, Elliott	Dudley
1843		Holt, George Palmer	Bexley Heath
1853		Holt, Richard Wylde	Seacombe
1853	13	Hooker, Thomas E.	Wellington
1842		Hooper, Henry	Brighton
1853		Hopper, Richard	Sunderland
1841		Hopwood, Henry J. S.	Richmond, Surrey
1860	404	Hopwood, Thomas S.	Richmond, Surrey
1841		Horncastle, Henry	Sheffield
1841		Horner, Stephen	Hartlepool
1845		Hornsby, John Harwood	Odiham
1857	174	Hornsby, George G.	Cheltenham
1853		Horsey, James	Portsea
1851		Houghton, James	Liverpool
1853		Houghton, Thomas	Oxford

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1859	448	*Houghton, William	Preston
1856	214	Houlton, James	Wetherby
1841		Howard, Robert	Stratford-le-Bow
1853		Howard, John Eliot	Stratford-le-Bow
1853		Howard, Richard	Tunbridge Wells
1842		Howard, John	Manchester
1842		Howman, Philip	Winchcombe
1846		Howorth, James	Doncaster
1855		Howson, Thomas J.	Gateshead
1851		Howson, Thomas B.	Oxford
1853		Hubbard, Robert W.	Kenilworth
1842		Hudson, Richard	Kendal
1851	10	Huggins, George Thomas	Barnet
1849		Hughes, Edward	Altrincham
1842		Hughes, Samuel	Stourbridge
1842		Hulbert, Robert Skeat	Basingstoke
1853		Hulme, John Hughes	Norwich
1853		Hulme, Thomas	Oldham
1842		Humphreys, Matthew	Nottingham
1842		Humphreys, Thomas	Birmingham
1842		Hunt, Henry	Wandsworth
1851		Hunt, Thomas	Wolverhampton
1855	104	*Hunt, Richard	Andover
1853	135	Hunter, David	Edinburgh
1853		Hunter, John	Gosport
1842		Huntley, John	Wimborne
1855		Hurdon, James	Appledore
1853		Hurman, John	Bridgewater
1844		Hurst, William T. H.	Hempstead, Gloucester
1842		Hurst, John	Louth
1842		Husband, Matthew	Exeter
1853		Iliffe, Thomas	Nuneaton
1853		Ingham, Henry	Wellingore
1853		Ingham, Richard H.	Manchester
1853	306	Isaac, George Washington	Bristol
1852		Iverach, William	Kirkwall
1854	136	Jaap, John	Glasgow
1842		Jackson, William George	Hartlepool
1841		Jackson, Thomas	Manchester
1852	105	Jackson, William	Crediton
1853		Jackson, Henry	Liverpool
1845		Jackson, Edmund	Lancaster
1842		James, John	Truro
1853		James, John Parry	Cardiff
1853		James, Henry	Bognor
1853		Jameson, Walter C.	Bath
1853		Jefferson, Peter	Leeds
1848		Jeffery, Moses Williams	Devonport
1853		Jeffrey, Russell	Cheltenham
1846		Jenkins, Henry Maine	Christchurch
1853		Jenkins, John	Peterchurch
1859		Jenner, William M.	Sandgate
1855	286	Jennings, John Edgell	Southampton
1841		Jennings, William	Halifax
1842		Jennings, Reginald	Hereford

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1844		Jennings, John E. H.	Sheffield
1853		Jessop, Jonathan	Halifax
1852		Jobson, William	Dundee
1858	390	Johnson, George	Birmingham
1853		Johnson, Thomas	Leek
1841		Johnson, John H.	Liverpool
1853		Johnson, John B.	Uttoxeter
1841		*Johnson, Samuel	Liverpool
1853		Jones, John	Aberdare
1848		Jones, Charles	Birkenhead
1842		Jones, Edward Bowen	Carmarthen
1841		Jones, Charles	Hanley
1842		Jones, William	Hastings
1845		Jones, John	Holywell
1841		Jones, William B.	Kingston-on-Thames
1845		Jones, Samuel Urwick	Leamington
1842		Jones, William	Liverpool
1859	465	Jones, Humphrey	Llangollen
1853		Jones, David	Narberth
1853		Jones, Thomas J.	Newport
1853		Jones, Ellis Powell	Rhyl
1848		Jones, James	Salford
1853		Jones, William Thorpe	Southwell
1847		Jones, James	Newcastle-on-Tyne
1844		Jones, Oliver Ellis	Welshpool
1853		Jones, Thomas	Welshpool
1857	115	*Joy, Francis William	Cardiff
1859	473	Judd, William	Hertford
1842		Judson, Thomas	Ripon
1846		Jull, Thomas	Horsham
1853		Keall, Powell Skinner	Bristol
1845		Keeling, George Ratcliffe	Epsom
1852		Keene, Alfred	Leamington
1853		Keith, James	Aberdeen
1852	137	Kemp, David	Portobello
1841		Kemp, Grover	Brighton
1854		Kemp, John	Brighton
1848		Kemp, William	Horncastle
1841		Kendall, Frederick	Stratford-on-Avon
1844		Kendall, George	Masham
1853		Kennedy, William	Glasgow
1853		Kent, Alfred	Basingstoke
1852		Ker, Thomas	Edinburgh
1853		Kernick, Samuel Penrose	Cardiff
1843		Kernot, Joseph	Naples
1843		Kernot, Septimus	Naples
1847		Kershaw, James	Southport
1842		Kiddy, Samuel	Belper
1841		Kimbell, Henry	Knowle
1852		Kinder, John	Glossop
1842		King, Joseph Raymond	Bath
1853		King, William George	Market Drayton
1841		King, Thomas Simmons	Rochester
1853		King, William	Soham

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		King, Charles Montague	Southend
1853		King, Ellis	Southend
1858	234	Kinninmont, Alexander	Glasgow
1854	276	Kirk, John	Maidstone
1853		Kirk, Charles	Hartley Row
1853		Kirk, Thomas	Liverpool
1853		Kirkbride, William	Penrith
1859	299	Kirkman, George B	Plymouth
1842		Kitching, Charles	Haverhill
1853		Knapman, John	Exeter
1854		Knight, Joseph	Bath
1842		Knight, Edward Sackville	Bridport
1858		Knight, John	Cambridge
1843		Knight, Alfred	Margate
1841		*Knott, Thomas	Exeter
1844		Knowles, Richard John	Demerara
1852		Knowles, John J	Sandwich
1853		Laen, William	Pembroke Dock
1853	187	Laird, William	Dundee
1853		Lamotte, Thomas Gallye	Bristol
1853		Lancaster, Henry	Croydon
1853		Lane, Joseph	Hampstead
1842		Langford, William	King's Lynn
1858	100	Langman, Peter	Chatteris
1843		Lansdale, Ralph	Wycombe
1853		Lasham, John	Dedham
1841		Lathbury, Robert	Liverpool
1842		Lavers, Thomas Howard	Blackheath
1853		Law, William	Forfar
1842		Lea, Henry Clairmont	Hastings
1853		Lea, Samuel	Ellesmere
1841		Lea, John Wheeley	Worcester
1859	183	*Lea, Charles Wheeley	Worcester
1853		Leach, John	Crawley
1855		Leadbetter, William Austin	Melton Mowbray
1841		Leay, Joseph	Birmingham
1846		Leggett, John Tudway	Wareham
1853		Leighton, John H.	Durham
1852		Leith, James	Edinburgh
1853	138	Lever, William	Hastings
1853		Lewin, Edwin C.	Boston
1841		Lewin, William	Plymouth
1856	310	Lewis, Thomas Cooper	Rugby
1857		Limon, Henry	Burgh
1841		Lindsay, Robert	Edinburgh
1857	406	Lingwood, James Grace	Northampton
1841		Lines, George	Hertford
1849		Linsley, Thomas	York
1844		Lister, George	Cottingham
1854	215	Littlefield, James Wavell	Ventnor, Isle of Wight
1842		Lloyd, Edmund	Richmond
1856	436	Lloyd, Henry	Richmond
1853		Lloyd, Henry	Deptford
1853		Lock, William	Boston

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1846		Lockyer, George	Deptford
1841		Lofthouse, James	Hull
1859	236	Logan Richard	Edinburgh
1853		Loggin, Charles Frederick	Stratford-on-Avon
1859		Long, William Elliot	Chichester
1858	479	Long Henry	Croydon
1853		Longfield Joseph	Leeds
1853		Longrigg, John	Appleby
1853		Lord, Ellis	Rochdale
1853		Lord, Charles	Todmorden
1853		Loveitt, George	Coventry
1841		Lovett, John	Gloucester
1841		Lowe, Thomas	Liverpool
1842		Lowndes, Hervey	Stockport
1841		Loye, Philip	Plymouth
1853		*Luff, William	Oxford
1853		Lumsden, James	Peterhead
1853		Lupton, Thomas	York
1842		Lynch, John R.	Manchester
1842		Mabson, William	Great Yarmouth
1842		Macfarlan, John F.	Edinburgh
1852	139	Macfarlane, Wardlaw	Edinburgh
1853		McDiarmid, John B.	Deal
1853		McGregor, Andrew	Glasgow
1841		Mackay, John	Edinburgh
1852		Mackenzie, Duncan	Edinburgh
1852		Mackintosh, Archibald	Rothesay
1856	140	Mackintosh, James	Galashiels
1841		Maddock, William	Tunbridge Wells
1853		Madge, James C.	Devizes
1848		*Maggs, Samuel Blount	St. Leonards
1845		Maggs, Thomas C.	Yeovil
1845		Maleham, Henry	Sheffield
1844		Maling, William	Newcastle-on-Tyne
1842		Manfield, John W.	Salford
1853		Manifold, John J.	Weaverham
1859		Mann, Robert	Newcastle-on-Tyne
1841		Manthorp, Samuel	Colchester
1850		March, William	Newark
1846		Marchant, Charles Frederick	Ipswich
1845		Marder, John J. W.	Lyme Regis
1857	481	*Maries, Henry Davies	Watford
1846		Marks, George	Bradford-on-Avon
1857	205	Marks, Edward L.	Swansea
1853		Marlor, Jabez	Lees, near Oldham
1845		Marsden, Joseph	Middleton-on-Tees-
1842		Marsh, William M.	Sevenoaks [dale
1842		Marshall, John F.	Gainsborough
1853	311	Marshall, Robert	Boston
1842		Marshall, James A.	Waltham Abbey
1842		Marston, Richard	Ludlow
1841		Martin, John	Bristol
1842		Martin, Edward W.	Guildford
1845		Martin, Thomas	Lewes

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Martin, Thomas	Liverpool
1851		Martin, Henry G.	St. Albans
1853		Martyn, John Jones...	Brighton
1853		Mason, Joseph W.	Cirencester
1842		Mason, William W.	Manchester
1853		Mason, William	Hastings
1853		Mather, William	Manchester
1853		Maunder, Alexander	Weston-super-Mare
1848		Maunder, Frederick	Sheffield
1853		Mawson, John	Newcastle-on-Tyne
1842		May, Enoch	Tewkesbury
1848		Maynard, Robert H.	Brandon
1842		Mays, Robert James John	South Shields
1843		Meadows, John	Leicester
1842		Mease, Solomon	North Shields
1853		Mease, Robert D.	North Shields
1842		Meatyard, Robert	Basingstoke
1842		Medcalf, Benjamin	Ware
1843		Medcalf, Ebenezer	Lower Tooting
1853		Medd, Joseph	Gloucester
1857	215	Medley, William	Derby
1845		Medwin, Aaron	Blackheath
1859	507	*Mercer, Nicholas	Fairfield
1853		Meredith, Edwin Richard	Bristol
1850		Merrick, Thomas J.	Northampton
1853		Merryweather, Charles	Leicester
1854	106	*Metcalfe, Christopher L.	Hull
1857	485	*Michell, Frederic	Mevagissy
1853		Millais, Thomas	Jersey
1853		Miller, Jeptha	Saffron Walden
1842		Miller, Charles	Oxford
1843		Miller, Robert P.	Reading
1853		Miller, William Henry	Sheffield
1853		Miller, John Thomas	Sheffield
1853		Mills, James Arthur	East Dereham
1847		Mitchell, John	Manchester
1842		Mole, William Tingey	St. Neots
1846		Monro, Henry L.	Gateshead
1846		Moore, John	Blackpool
1841		Moore, Richard Coley	Brighton
1841		Mordaunt, Alfred	Southampton
1853		Morgan, William	Pillgwenlly
1844		Morris, Alfred Philip	Stourbridge
1844		*Morse, George	Mortlake
1852		Morton, John	Durham
1853		*Morton, Jameson	Ramsbottom
1845		Morton, Henry	Ramsgate
1844		Morton, George	Stratford-le-Bow
1849		Moss, William	Carlisle
1853		Mount, William	Canterbury
1842		Mount, John	Manchester
1853		Mousley, William	Redditch
1841		Mullett, Charles	Ilminster
1847		Mumbray, Robert Goodwin	Manchester

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Mumby, Charles	Gosport
1853		Munday, Edward Smith	Worthing
1851		Mundy, William	Melksham
1853		Murdoch, David	Falkirk
1853		Murdoch, William	Glasgow
1852	63	Murdoch, George	Glasgow
1849		Murdoch, James	Glasgow
1841		Muriel, Harry Brooke	Brighton
1849		Muskett, Charles	Derby
1842		Muskett, James	Harleston
1844		Musson, Telemachus G.	Birmingham
1848		Naftel, Thomas P.	Guernsey
1842		Napier, James	Edinburgh
1853		Narracott, Henry	Torquay
1856	262	Needham, Slater	Leicester
1842		*Negus, Samuel	Northampton
1853		Newbery, Henry	Biggleswade
1853		Newby, William Henry	Perth
1853		Newcome, John	Grantham
1854		Newman, Robert	Bewdley
1845		Newman, Thomas	Hartley Row
1853		Newman, Walter F.	Falmouth
1853		Newton, George	Newcastle
1847		Newton, Christopher	Edinburgh
1853		Nicholas, John	Narberth
1841		Nicholls, James	Stourbridge
1852		Nicol, George	Pulteney Town
1845		Nind, George	Wandsworth
1853		Nix, John K.	Billericay
1841		Noakes, Richard	Brighton
1858	522	Noble, Alexander	Edinburgh
1846		Northcroft, Jonathan	Plymouth
1853		Norwood, Thomas	Hastings
1842		Oakey, Joseph Malpas	Preston
1853		Oldham, William Thomas	Wisbeach
1853		Oliver John	Liverpool
1842		Orange, John	Portsea
1845		Otter, William	Bloxham
1842		Overbury, Henry	Alcester
1845		Owen, Griffith	Caernarvon
1842		Owen, William	Newcastle-on-Tyne
1845		Owles, James	Bungay
1842		Owles, John	Yarmouth
1842		Paine, William	Canterbury
1841		Palk, Edward	Southampton
1841		*Palk, John	Exeter
1853		Palmer, Charles F.	Birmingham
1853		Palmer, Henry	Birmingham
1847		Palmer, Faithful	Cheltenham
1842		Palmer, Thomas J.	East Grinstead
1842		Parker, Edward	Carlisle
1853		Parker, Frederick	Derby
1853		Parker, John	Birmingham
1853		Parker, Matthew	Bath
1853		Parker, William Henry	Nottingham

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1841		Parker, Thomas	Halifax
1842		Parkes, Joseph	Atherstone
1853		Parkes, John C.	Woolwich
1854	312	*Parkes, John P.	Manchester
1842		Parkinson, Thomas	Liverpool
1847		Parkinson, Robert	Bradford
1841		*Parnell, John	Peterborough
1842		Parsons, Thomas	Leicester
1850		Parsons, William	Portsmouth
1853		Parton, Joseph	Nantwich
1353		Pasmore, George	Portsmouth
1853		Pate, Henry Thomas	Ely
1853		Paterson, William	Aberdeen
1853		Patterson, George	Stamford
1858	453	*Patterson, Douglas John	Mansfield
1853		Pattinson, Richard John	Carlisle
1841		Paul, Horace	Halsted
1853		*Paulden, William	Altrincham
1841		Payne, Reuben Craven	Bridgewater
1854	314	Peake, Henry	Dover
1855	313	Peake, James	Walmer
1842		Pearce, Thomas	Gloucester
1852		Pearless, John	East Grinstead
1853		Pearman, Henry	Stourbridge
1842		Pearson, Charles James	Loughor
1851		Pearson, Edward	Liverpool
1842		Peart, David	Ewell
1842		Peat, Walter	Fareham
1853		Peatson, Henry Robert	Salford
1853		Pegg, Herbert	Birmingham
1852		Penney, William	Poole
1853		Penrice, Joseph	Workington
1851		Peppercorn, Benjamin	Lincoln
1855		Perfect, George	Portsea
1841		Perrins, William	Worcester
1843		Perry, Solomon	Tavistock
1853		Pertwee, Edward	Romford
1853		Pertwee, Alfred R.	Chelmsford
1853		Phillips, John	Birmingham
1852		Phillips, Edward James	Newport, Monmouth
1853		Phillips, John	Newport, Monmouth
1856	326	Phillips, William Thomas	Carmarthen
1845		Philpott, John	Bromyard
1842		Pickering, Henry	Leicester
1853		Pickering, Atkinson	Hull
1845		Pickup, Thomas Hartley	Blackburn
1841		Pickup, John	Manchester
1848		Pickup, Varey	Salford
1859	301	*Picnot, Charles	Strood
1858	431	*Pidduck, John	Brompton
1853		Pidgeon, Henry	Shrewsbury
1853		Pidgeon, John	Taunton
1841		Pierce, Edward Lloyd	Shelton
1853		Pilley, Samuel	Boston
1853		Pilley, John	Boston

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Piquet, John	Jersey
1853		Pissey, William	Rayleigh
1853		Pitts, Robert Christopher	Norwich
1859	289	Place, William Thomas	Wakefield
1853		Player, Edmund	Bristol
1842		Plomley, James Foulis	Rye
1842		Pocklington, James	Sydenham
1853		Pollard, William J.	Nailsea
1852		Ponting, Thomas Cadby	Bristol
1845		Pooley, John Carpenter	Bath
1846		Portway, John	Bury St. Edmunds
1853		Potts, Thomas	Newcastle-on-Tyne
1855		Poulton. John	Newton Abbot
1852		Powell, Frederick W.	Leith
1842		Powell, John	Shaftesbury
1842		Powell, Edward	Winchester
1852		Power, Edward	Walton-on-Thames
1841		Pratt, John	Chichester
1846		Pratt, John	Bradford
1853		Pratt, Richard Munton	Otley
1853		Priestlay, Henry	Pontefract
1852		Prince, Henry	Taunton
1855	290	*Pring, Walter	Taunton
1855		Prior, George T.	Oxford
1842		Prockter, Richard Edgcumbe	Cheltenham
1841		*Procter, William	Settle
1853		Procter, Joseph	Beverley
1848		Proctor, William	Newcastle
1841		Proctor, William B.	Newcastle
1857		Proctor, Barnard S.	Newcastle
1859	384	*Prosser, Thomas Evan	Woodstock
1852	144	*Prott, William	Huntley
1842		Prout, Robert	Milton Abbot
1852	327	Prowse, Charles	Bristol
1853		Pryer, William Symes	Axminster
1852		Pullin, Edwin	Northampton
1841		Purdue, Thomas	Witney
1855	355	*Pyne, Joseph J.	Manchester
1853		Quine, James	Douglas, Isle of Man
1851		Radford, Isaiah C.	Devonport
1841		Radley, William Valentine	Sheffield
1842		Raimes, Richard	Edinburgh
1854	302	Rainey, Edward	Spilsby
1853		Rait, Robert C.	Partick
1853		Ralfs, Henry Charles	Brentford
1853		Ramsey, Henry P.	Ashford
1841		Ramskill, Parson	Leeds
1841		Randall, Edward Mayor	Southampton
1845		Randall, William Brodribb	Southampton
1853		Randall, Thomas	Wareham
1853		Randleson, William	Whitehaven
1853		Ranken, James Anderson	Forfar
1848		Rankin, William	Kilmarnock
1842		Ransford, Samuel	Cleveden
1853		Ransom, William	Hitchin

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Ransome, Thomas	Manchester
1851		Rastrick, George T.	Geelong
1853		Rastrick, William Henry	Portsea
1842		Rastrick, Joseph Linington	Southsea
1842		Rastrick, John Alfred	Woolwich
1841		Raw, John	Preston
1853		Rawdin, Joseph	Jedburgh
1841		Rawle, William	Crawley
1854	206	Rayner, John	Nottingham
1852		Rayner, John	Uxbridge
1859	543	*Rayner, John Charles	Uxbridge
1859	408	Rayner, William	Sheerness
1842		Reading, Robert Grant	Warwick
1841		Readman, William	Leighton Buzzard
1842		Redfern, John	Ashby-de-la-Zouch
1853		Redmayne, Christopher	Warrington
1853		Rees, William Henry	Dartmouth
1853		Reid, David	Aberdeen
1853		Reid, John	Montrose
1857	251	Reid, Neil	Perth
1856		Reilly, William Charles	Hampstead
1845		Reinhardt, Johan Christian	Hull
1841		Reinhardt, George	Leeds
1848		Rendall, John M.	Torquay
1842		Reynolds, William	Halesworth
1854	109	Reynolds, Richard	Leeds
1849		*Rhodes, Frank	Wycombe
1853		Rhodes, James	Manchester
1853		Rich, Thomas	Weston-super-Mare
1853		*Richards, William	Falmouth
1853		Richardson, Allen	Manchester
1842		Richmond, Robert	Leighton Buzzard
1842		Rimmington, Felix U.	Bradford
1842		Ritson, John George	Sunderland
1842		Ritson, Thomas	Sunderland
1847		Roberton, James	Manchester
1853		Roberts, Thomas A.	Conway
1852		Roberts, Griffiths J.	Holyhead
1842		Roberts, Charles	Westbury
1841		Roberts, Albinus	St. Albans
1858	483	*Roberts, Peter	Denbigh
1852		Robertson, James	Edinburgh
1853	331	*Robertson, Thomas Berkley	Cullen
1854		Robinson, Levi	Alford
1842		Robinson, James Mowld	Beverley
1855	249	Robinson, Ralph	Lynn
1842		Robinson, Charles L.	Wellington
1855	193	Robinson, Benjamin	Pendleton
1853		Robinson, James	Nottingham
1851		Robson, Thomas	Brighton
1842		Robson, George	Durham
1853		Rodgerson, William	Liverpool
1847		Roe, Septimus	Salisbury
1842		Roe, Thomas	Ollerton
1853	5	Rogers, John Robinson	Honiton

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Rogers, William	Maidstone
1842		Rogers, John	Ledbury
1842		Rogerson, Michael	Bradford
1853		Rome, Robert M.	Langholm
1853		Rook, Edward	Sittingbourne
1853		Rooker, Abel	Chepstow
1851		Roose, Robert	Ruthin
1845		Ross, Stephen	Lancaster
1853		Row, Charles	Devonport
1843		Rowe, John	Plymouth
1853		Rowlands, Thomas	Epping
1853		Rowlands, William S.	Devizes
1846		Russell, Thomas	South Shields
1853	84	Russell, Charles J. L.	Windsor
1853		Rust, James	Thaxted
1853		Rutherford, Thomas H.	Seaham Harbour
1853		Sagar, Henry	Leeds
1841		Salisbury, John	Sheffield
1858	219	Salisbury, William Bryan	Leicester
1842		Sanders, Henry Wotton	Bristol
1847		Sandiland, Robert B.	Bicester
1853		Sangster, John	Aberdeen
1853		Satterley, William B.	Guernsey
1845		Saunders, David Price	Haverfordwest
1853		Saunders, George J.	Oswestry
1841		Savage, William Dawson	Brighton
1853		Sawer, William	Stroud
1841		Sawyer, Thomas	Ramsgate
1842		Sawyer, James	Carlisle
1853		Saxby, Henry	Lewes
1852		Scarrow, William	Sunderland
1846	2	Schacht, Frederick George	Clifton
1853		Scott, Edward	Birmingham
1857	317	Scott, George	Bury St. Edmunds
1856	426	Searby, William M.	Norwich
1854	239	Seath, Alexander	Dunfermline
1847		Seaton, John Love	Hull
1849		Seaton, George	Chelmsford
1841		Selfe, Isaac	Bristol
1843		Severs, Joseph	Kendal
1846		Sewell, James C.	Sheffield
1853		Sewell, John Holmes	Swindon
1841		Seyde, John F.	Willenhall
1841		Shackel, John Well	Maidenhead
1853		Shadford, Major	Spalding
1853		Sharland, Edmund T.	Bristol
1853		Sharp, Benjamin	Liverpool
1847		Sharp, Henry	Christchurch
1842		Sharp, Joseph	Salford
1841		Sharples, William	Preston
1843		Sharples, George	Preston
1853		Shattock, John	Taunton
1848		Shaw, John	Liverpool
1842		Shaw, Alexander Henry	Stockport

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1854		Shenstone, James B.	Colchester
1853		Shepherd, James	Aberdeen
1857	371	Shepherd, George Prentis	Guildford
1848		Shepperley, James	Nottingham
1853		Shield, Spooner	Liverpool
1852		Shield, George	Arbroath
1842		Shillcock, Joseph Bradley	Bromley, Kent
1841		Shum, Henry	Swansea
1853		Sidebottom, William	New Mills
1842		Silvester, Joseph	Knutsford
1853		Sim, James	Aberdeen
1853		Sim, George	Kelso
1842		Simonds, William	Boston
1843		Simpson, John	Hull
1842		Simpson, Thomas	Stowmarket
1853		Sinclair, William	Aberdeen
1853		Sincock, William	Andover
1852		Sircom, Richard	Bristol
1841		Sirett, George	Buckingham
1853		Slayter, George	Reading
1853		Smale, Richard Bill	Oswestry
1843		Smallwood, John Wright	Macclesfield
1853		Smart, Nevill	Littlehampton
1841		*Smeeton, Edward	Leeds
1859	454	Smeeton, William	Ironbridge
1853		Smethurst, Richard L.	Salford
1853		Smith, John	Aberdeen
1842		*Smith, William	Abingdon
1853		Smith, William	Bridlington
1853	169	Smith, William	Brighton
1841		Smith, Nathaniel	Cheltenham
1841		Smith, Thomas	Colchester
1853		Smith, Henry	Eccleshall
1853		*Smith, Thomas	Edinburgh
1842		Smith, Henry	Edinburgh
1853		Smith, James S. T. W.	Haltwhistle
1856	416	*Smith, Thomas J.	Hull
1853		Smith, Josias	Hyde
1842		Smith, William	North Shields
1849		Smith, William	St. Andrews
1843	31	Smith, John	Southampton
1842		Smith, William	Sutton Coldfield
1842		Smith, Alfred	Tenterden
1842		Smith, James Russell	Woodbridge
1842		Smith, William	Woolwich
1853		Smyth, Walter	Merthyr Tydfil
1842		Snape, Edward	Birmingham
1841		Snowdon, George Wrangham	Wimbledon
1841		Southall, William	Birmingham
1841		Southall, Thomas	Birmingham
1850		Southall, William, jun.	Birmingham
1859	534	*Southall, Joseph Sturge	Nottingham
1842		Sowerby, John	Carlisle
1852		Spence, Thomas B.	Dundee

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1843		Spencer, Charles	Gravesend
1842		Spencer, William	Monmouth
1853		Spencer, William Henry	Burnham Market
1853		Spencer, Thomas	Wokingham
1853		Spencer, George	Lincoln
1842		Spettigue, Joseph	Launceston
1842		Spicer, Thomas	East Moulsey
1853		Spokes, Peter	Reading
1845		Spong, Thomas Willsden	Biggleswade
1853		Spurr, John	York
1842		Squire, William	Hanwell
1853		Squire, William	Nottingham
1853		Squire, William	Goole
1853		Stafford, William	Gloucester
1842		Standring, Thomas	Manchester
1860	480	*Stanford, Edward C. Cortis	Worthing
1842		Stantial, John	Corsham
1847		Stead, William	Horbury
1856	291	Steel, Henry	Shefford
1853		Steel, Samuel	Beccles
1855	148	Steele, David	Edinburgh
1853		Stephens, Thomas	Merthyr Tydfil
1858	492	*Stephenson, John B.	Edinburgh
1853		Sterriker, John	Driffield
1849		Stevens, John	Birmingham
1852		Stevens, George	Strood
1846		Stevenson, Richard	Derby
1842		Steward, Charles S. Dale	Yarmouth
1854	278	Steward, Alfred	Yarmouth
1847		Steward, William	Bridgnorth
1841		Steward, Josiah	Kidderminster
1841		Steward, Theophilus	Kidderminster
1853		Steward, John	Brierley Hill
1858		Stewardson, Henry	Bedford
1841		Stiell, Gavin	Dunfermline
1858	491	*Stirling, George	Dunoon
1853		Stoddart, William Walter	Bristol
1853		Stone, John	Exeter
1852		Stonham, Thomas G.	Maidstone
1841		Stott, William	Sowerby Bridge
1853		Strange, William Bond	Bristol
1847		Strawson, Henry	Crewkerne
1856	292	Stroud, John	Bristol
1842		Stuart, Charles	Woolwich
1853		Stuart, Henry W.	Woolwich
1853		Sturton, Joseph	Cambridge
1841		Sturton, John	Peterborough
1855	394	*Sturton, Richard	Peterborough
1853		Suggate, Henry Ezra	Yarmouth
1852		Sumner, Robert	Liverpool
1855	170	Sumner, William	Birmingham
1852		Sumner, John	Birmingham
1853		Sutherland, John	Aberdeen
1853		Sutterby, Jonathan N...	Long Sutton

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Sutton, Francis	Norwich
1860	573	*Sutton, Charles William	Stowmarket
1843		Symonds, John	Aylsham
1853		Symons, William	Dunster
1852	149	Tait, William	Edinburgh
1841		Tanner, Nicholas William	Exeter
1853		Taplin, Joseph	Bristol
1847		Tarzewell, Richard	Braintree
1841		Tatham, John Walkingame	Barnstaple
1852		Tatham, Leonard F.	Bradninch
1845		Tayler, William Henry	Warminster
1848		Taylor, John Usher	Bedford
1842		Taylor, James	Manchester
1853		Taylor, Henry	Manchester
1842		Taylor, Thomas H.	Manchester
1850		Taylor, Sydney	Pendleton
1841		Taylor, John	Preston
1852		Taylor, John Hawarden	Preston
1853		Taylor, Thomas John	Preston
1842		Taylor, Edward	Rochdale
1854	362	Taylor, Richard	Ryde
1842		Taylor, Thomas	Stalybridge
1852		Taylor, John	Wakefield
1842		Taylor, Stephen	Westbury
1841		Taylor, William James	Middlesborough
1848	7	Teasdale, Thomas B.	Darlington
1842		Teear, John Manshaw	Leicester
1842		Telfer, Frederick	Oxford
1853		Templeton, John	Glasgow
1842		Thomas, John Holliday	Boston
1852		Thomas, Robert	East Looe
1846		Thomas, Richard	Burnley
1853		Thomas, John	Cowbridge
1853		Thomas, James	Bridge, Kent
1853		Thomas, James	Hythe
1853		Thompson, George	Alston
1846		Thompson, Andrew	Carlisle
1849		Thompson, John	Liverpool
1842		Thompson, Henry	Middlesborough
1853		Thompson, Henry	Norwich
1846		Thompson, Edward	Otley
1850		Thompson, Thomas	Richmond, Yorkshire
1853		Thompson, William	Sunderland
1859	502	Thompson, John Robert	Bishopwearmouth
1841		Thompson, John	Thirsk
1853		Thonger, Gilbert	Birmingham
1853		Thorne, John	Bedford
1853		Thornton, John	Wedmore
1853		Thornton, Edward	Lyme Regis
1842		Thornton, Samuel	Exmouth
1857	417	Thornton, John Barber	Dover
1853		Thurland, Edward	Oxford
1853		Tiernan, Robert	Liverpool
1853		Timothy, Thomas Norris	Reading
1841		Titherington, Thomas A.	Liverpool

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1843		Tomlinson, Charles Knowles	Lincoln
1847		Tonge, James Scawin	York
1853		Toone, Joseph Vidler	Warminster
1853		Townsend, John H.	Bristol
1853		Townson, Thomas	Leamington
1842		Tozer, Richard John	Exeter
1841		Tribe, John	Chatham
1841		*Trix, John	Exeter
1841		Trueman, William	Durham
1853		Truman, Francis C.	Jersey
1841		Tryon, William George	Portsea
1842		Tuck, William H.	Torquay
1857	342	*Tuck, Francis	Oxford
1843		Tucker, Charles	Bridport
1853		Tucker, James	Gloucester
1860	515	*Tucker, Henry	Newport, Monmouth
1853		Tuff, John	Enfield
1842		Tunley, John	West Bromwich
1853		Turner, Robert	Oundle
1856	264	Turner, Walter	Mold
1851		Turner, Frederick E.	Holywell
1854	265	Turner, William Henry	Oswestry
1848		Turner, John A.	Liverpool
1853	162	Turney, Samuel B.	Cambridge
1853		Turton, Luke	Bradford
1853		Turton, Thomas J.	Howden
1859	516	*Twinberrow, John	Worcester
1841		Tylee, John P.	Bath
1842		Uppleby, Henry	Leamington
1853		Urquhart, James	Aberdeen
1852		Urwin, John	Bedlington
1853		Veitch, James	Dunse
1853		Veitch, William	Shildon
1845		Vincent, Philip	Fulham
1853		Vose, Thomas	Liverpool
1842		Wain, William	Ripley
1842		Wainwright, James	York
1842		Waite, Joseph	Cheltenham
1853		Walker, John C.	Birmingham
1853		Walker, John	Bradford
1841		Walker, George Clarke	Doncaster
1842		Walker, Edward Hawxby	Doncaster
1853		Walker, Thomas D.	Liverpool
1842		Walker, William	Malmsbury
1847		Walker, Edward	Newcastle-on-Tyne
1846		Walker, William Henry	Southport
1842		Walkinton, William	Tenby
1848		Wall, William James	Tottenham
1857	75	Wallworth, David	Maldon
1860	266	Walmsley, Samuel	Kingston-on-Thames
1854	343	Walsh, Edward	Manchester
1852		Walsh, William	Oxford
1853		Walter, Joseph	Horncastle
1848		Walton, John	Sunderland

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1842		Warburton, Thomas	Bolton
1841		Ward, James	Falkingham
1853		Ward, Francis	Battle
1851		Ward, William	Sheffield
1853		Wardle, William Henry	Stalybridge
1842		Warrior, William	Northallerton
1853		Waterall, George	Nottingham
1853		Waterall, George Edwards	Nottingham
1853		Waterfall, William	Newcastle
1847		Waterson, John	Birmingham
1842		Watkins, George H.	Walsall
1853		Watkinson, Thomas	Cinderford
1841		Watlock, John Dawson	Wandsworth
1853		Watlock, Benjamin D.	Battle
1846		Watson, Henry	Cambridge
1847		Watson, Edward M.	Worle
1859	517	*Watson, David	Kettering
1853		Watt, James	Haddington
1853		Wavell, John	Ryde
1853		Wearing, William	Lancaster
1853		Wearing, William Henry	Liskeard
1848		Wearing, Richard	Liverpool
1842		Weaver, Frederick	Wolverhampton
1853		Webb, Thomas S.	Bilston
1853		Webber, George William	Torquay
1853		Webster, Edwin P.	Newcastle-on-Tyne
1852		Webster, Samuel M.	Warrington
1845		Weeks, Caleb	Torquay
1853		Welch, Charles	Nottingham
1844		Weller, George	Windsor
1850		Wellington, Frederick G. N.	South Petherton
1842		Wellington, James Martin	Oakham
1853		Wellman, William Richard	Jersey
1852		Welsh, Alexander	Dalkeith
1853		West, Henry James	Coventry
1850		West, Isaac	Oxford
1856		West, William	Henfield
1846		Westall, Richard H.	Ramsgate
1853		Westmacott, George	Manchester
1854	180	Wharrie, Decimus	Liverpool
1854	156	*Wheeler, Francis	Norwich
1847		Wheeler, John	Chipping Sodbury
1846		Wheeler, James Edward	Ryde
1842		Whimpray, John	Lancaster
1853		Whitall, James	Chertsey
1853		White, Frank	Nottingham
1842		White, Robert Rowles	Dursley
1842		White, Thomas	Bilston
1846		Whitehead, Edwin	Fleetwood
1853		Whitehead, John	Rochdale
1842		Whitfield, John Lockley	Worcester
1847		Whitfield, John	Worcester
1846		Whitlock, Edwin	Salisbury
1853		Whittaker, William	Runcorn
1852		Whittaker, Ellis	Salford

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Whittle, Samuel	Leigh
1841		Whitton, George	Horncastle
1852		Whitwell, John	Thirsk
1845		Wibmer, Lewis Michael	Tunbridge
1853		Wice, Jonathan Haigh	Wakefield
1849		Wickham William	Deptford
1842		Wigg, John Goddard	Lynn
1845		Wiggin, John	Ipswich
1853		Wild, Joseph	Hyde
1853		Wild, David	Oldham
1847		Wilde, Eli	Manchester
1852		Wilkes, Seth Martin	Tewkesbury
1850		Wilkes, Doctor Tyers	Upton-on-Severn
1842		Wilkes, William	Bromyard
1858		Wilkes, David	Bredon
1850	73	Wilkinson, William	Manchester
1854		Williams, Joel D.	Bodmin
1853		Williams, William	Haverfordwest
1844		Williams, Walter	Hereford
1853		Williams, Philip	Horsham
1853		Williams, John	Leamington
1853		Williams, Robert	Liverpool
1854		Williams, Terrick J.	Liverpool
1853		Williams, Edwin	Manchester
1857	474	*Williams, Henry Levi	Newport, Monmouth
1842		Williams, David	Pwllheli
1859	531	*Williams, Thomas Kemble	Welchpool
1844		Williamson, James	Hunslet
1853		Willmott, Charles	Brighton
1855	171	Wills, Thomas D	Barnstaple
1853		Wilshaw, James	Wordsley
1842		Wilson, Thomas	Bradford
1844		Wilson, Joseph	Canterbury
1853		Wilson, John	Harrogate
1855	303	Wilson, Joseph	Penrith
1853		Wilson, Edward	Sheffield
1841		Wilson, Charles Thomas	Swansea
1854		Wilson, William	York
1860	152	Wilson, James	Edinburgh
1841		Wine, John	Bristol
1842		Wing, Thomas N.	Melton Mowbray
1856	254	Wingate, Stephen	Gloucester
1847		Withers, Richard	Blackwater
1842		Witherington, Thomas	Worcester
1853		Withey, William Henry	Stroud
1842		Wood, Edwin	Abersychan
1853		Wood, Anthony	Arnold
1846		Wood, Henry	Brentford
1852	111	Wood, Edward	Brighton
1853		Wood, Benjamin	Halifax
1853		Wood, John Edward	Harlow
1842		Wood, William Webb	Pontypool
1853		Woodcock, Page D	Lincoln
1842		Woods, William	Worcester
1853		Woodward, Charles	Ryde

Year of Membership.	No. of Certificate.	NAME.	RESIDENCE.
1853		Woodward, William	Langport
1842		Wooldridge, Thomas	Windsor
1858	521	*Woolley, George Stephen	Manchester
1844		Woolley, Daniel	Stockport
1854		Woolrich, Thomas	Stone
1850		Wootton, William	Wolverhampton
1856	255	Wortley, John	Durham
1842		Wreaks, Thomas Peacock	Glossop
1842		Wreaks, George D.	Sheffield
1853		Wright, Joseph	Ardwick
1853		Wright, James	Chesterfield
1853		Wright, William	Liverpool
1846		Wright, George Warren	Macclesfield
1842		Wright, Charles	Manchester
1853		Wright, Thomas Williams	Buckley
1845		Wylde, John	Manchester
1845		Wylde, James	Manchester
1841		Wyley, John	Coventry
1852	153	Young, James R.	Edinburgh
1844		*Young, John	Sunderland
1853		Young, Tonkin	St. Ives
1853	224	Youngman, Edward	Bury St. Edmunds
1855	345	*Youngman, Robert	Cambridge

ASSOCIATES

ADMITTED BEFORE THE 1st OF JULY, 1842.

NAME.	RESIDENCE.
Baigent, William H.	London
Baker, Garrad	Chelmsford
Bannick, Henry Stokes	London
Barber, William Jas.	London
Beaton, John William	London
Bell, William	Carlisle
Bowman, William	London
Brewster, Godfrey W.	Cambridge
Brown, Henry F.	London
Buss, Thomas	London
Chadwick, Henry	London
Charity, William	Alford
Cowl, William	Durham
Dallas, John	London
Dunn, Edward	London
Handsley, Taylor	London
Hindsley, Henry	London
Lee, James	London
Mackay, John	Worcester
Mackey, John B.	London
Middleton, Francis	London
Morgan, William B.	London
Mornement, Henry J.	London
Peat, William H.	Ryde
Roberts, William	Bolton
Ryder, William Henry	Birmingham
Sawyer, Henry	Ramsgate
Scholefield, Henry	London
Selleck, Edward	London
Steele, John W.	London
Sylvester, Paul	Birmingham
Thompson, Morley	London
Tilburn, Robert J.	Sheffield
Townsend, Charles	London
Turner, George	Honiton
Walker, William	Malmsbury
Warren, William A.	Malmsbury
Were, Ellis	London
Williams, Walter C.	Brentwood
Wood, John	London

ASSOCIATES OF THE SOCIETY

WHO HAVE PASSED THE MAJOR EXAMINATION.

Year of Admission.	No. of Certificate.	NAME.	RESIDENCE.
1849	76	Alexander, William	Peckham
1857	477	Andrew, Leyshon	Swansea
1851	533	Anthony, John Lilley	Bedford
1858	510	Ashton, John	Belper
1851	419	Atkins, Ernest R.	Woolwich
1859	562	Austin, Henry Felix	London
1858	537	Baldock, John Henry	London
1846	424	Barker, Matthew Mark	York
1854	551	Barnes, Edwin	Durham
1854	374	Barnsby, Robert David	Tours
1853	256	Barry, Thomas	Aberavon
1848	402	Beach, James	Bridport
1853	346	Bennett, Robert	Lincoln
1853	576	Bennett, George	Blandford
1855	496	Berger, Volcy	Clapham
1852	208	Blackburn, Francis	Ramsgate
1857	577	Blackman, Thomas	Woolwich
1856	449	Bloye, Henry	Holt
1856	518	Bolton, Horatio Nelson	Boston
1857	495	Boucher, John	Belper
1853	209	Boyce, George	Chertsey
1853	444	Calvert, John	Durham
1853	376	Chapple, Edwin	Bideford
1853	527	Chater, Edward Mitchell	Watford
1854	380	Christopher, James	Crickhowell
1851	583	Church, Henry J.	London
1857	528	Clark, John	Grantham
1853	281	Cleave, Charles T.	Chudleigh
1853	547	Cook, William	Grantham
1846	91	Copney, William	London
1854	466	Cornelius, James	Clapham
1848	367	Cotton, John L.	Barnstaple
1853	395	Cracknell, Benjamin	Halesworth
1859	567	Crowe, Thomas Lea	Hereford
1850	470	Cutting, James	Stowmarket
1851	351	Daines, Thomas	London
1859	552	Davies, David	Cardigan
1852	523	Deighton, Thomas Milner	Worcester
1859	564	Delf, Frederick D.	Southampton
1859	566	Delves, George	Tunbridge Wells
1853	524	Dowse, Thomas Stretch	Bradford-on-Avon
1857	539	Dunhill, William Workman	Doncaster

Year of Admission.	No. of Certificate.	NAME.	RESIDENCE.
1859	568	Earle, Francis	Leeds
1853	368	Evans, William H.	Haverfordwest
1852	462	Eyre, Joshua J.	Manchester
1856	464	Featherston, John P.	London
1853	336	Fisher, William F.	London
1856	554	Fleetwood, Thomas	Stratford-on-Avon
1858	511	Francis, Thomas Harper	Dulwich
1850	403	Gibbons, George	Clifton
1858	569	Giddings, William H. C.	London
1859	570	Gilbert, George Fagge	London
1858	525	Gray, Frederick	London
1856	446	Green, John	Oundle
1855	548	Green, Conrad Samuel	Stratford-on-Avon
1854	529	Griffiths, Alfred William	London
1856	438	Groves, Henry	Weymouth
1856	584	Hall, Thomas Howard	Southampton
1858	563	Hartley, William	Birmingham
1859	571	Hickman, William	Manchester
1856	574	Hill, William	Edinburgh
1854	561	Hinton, Henry Archibald	London
1852	494	Humphreys, Richard	London
1857	497	Icke, Henry Scott	London
1856	476	Iverach, John G.	Kirkwall
1853	472	Johnson, Joseph	London
1848	382	Jones, Hugh Lloyd	Chester
1853	340	Jones, William Withers	Welchpool
1856	489	Jones, Peter Cooke	London
1853	578	Jones, Charles William	Carmarthen
1855	572	Keene, John	Brighton
1852	418	Kemp, David Skinner	Edinburgh
1853	307	Kiddle, William L.	Bath
1856	587	Lawrence, Henry	Stratford, Essex
1857	478	Lee, John William	Liverpool
1856	300	Linford, John	Canterbury
1854	388	Lomas, Joseph W.	London
1853	585	Long, Alfred Thorby	Brighton
1852	586	Long, Henry	London
1853	330	M'Intyre, Peter S.	Warkworth
1855	557	Madgwick, William Butler	Alresford
1856	451	Marks, Nelson S.	Cardiff
1853	247	Matterson, Edward H.	York
1857	512	Mee, George	Woolwich
1842	392	Mercer, Nathan	Liverpool
1850	579	Moon, William Henry	Ilfracombe
1853	216	Morgan, William	Richmond
1852	513	Nicholson, John Joseph	Sunderland
1855	580	Norrish, James	Crediton
1857	482	Oliver, John Hamer	Salop
1857	581	Orton, Thomas J.	Nuneaton
1856	520	Owles, Edward John	Southampton
1852	530	Paine, Standen	Brighton
1853	354	Parrott, John S.	Birmingham
1853	501	Parsons, Francis H.	Southam
1857	542	Pearson, George B.	Leeds

Year of Admission.	No. of Certificate.	NAME.	RESIDENCE.
1847	425	Peel, James	Canterbury
1853	413	Penton, Charles W.	Maidstone
1858	582	Pertwee, Frederic	London
1850	414	Player, Jacob H.	Bedford
1859	565	Powers, Edward	Stourbridge
1853	422	Preston, Richard	London
1850	108	Reeve, Edward	London
1856	439	Reynolds, Arthur	Watton
1855	440	Richards, Charles	Weymouth
1858	544	Richardson, Robert	Ipswich
1853	545	Roberts, John Albinus	Horsham
1848	250	Rolfe, William A.	Wokingham
1855	461	Rowell, Charles Frederick	Uppingham
1853	463	Sarsfield, William	Durham
1856	452	Scholefield, Arthur	Basingstoke
1853	316	Scott, Thomas	Birmingham
1853	188	Sidley, Thomas Insall	Edinburgh
1853	277	Sirett, George B.	Buckingham
1852	207	Skrimshire, Thomas	London
1848	441	Smeeton, George H.	Leeds
1853	356	Smith, Joseph	Birmingham
1857	475	Smith, William	Glasgow
1842	46	Starkie, Richard S.	London
1853	509	Steevens, Joseph G.	Guildford
1859	550	Street, Edward	Salisbury
1847	33	Swann, William H.	London
1855	409	Taplin, Frederick	Bristol
1860	575	Taylor, Herbert D.	Manchester
1853	221	Taylor, John N.	Lincoln
1853	320	Thompson, Henry	Leatherhead
1858	559	Thompson, Charles Henry	Huddersfield
1856	498	Tiplady, Frederick	York
1853	532	Tollinton, Richard B.	Stowmarket
1856	427	Tyler, Henry Wing	Leicester
1855	560	Videon, Charles	London
1853	253	Ward, Philip D.	Halifax
1853	456	West, Robert G.	Liverpool
1856	455	Weston, Charles	Lincoln
1857	503	Wheldon, Henry William	London
1851	114	Whitfield, Henry	Worcester
1853	423	Willett, Edmund	Brixton
1855	442	Williams, David Martin	Truro
1849	293	Williamson, David	Brighton
1854	359	Willmott, William	Bristol
1853	360	Woodcock, Joseph	Leicester

ASSOCIATES OF THE SOCIETY

WHO HAVE PASSED THE MINOR EXAMINATION.

Year of Admission.	No. of Certificate.	NAME.	RESIDENCE.
1857	547	Allan, William	Dumfries
1853	441	Allingham, George Samuel	London
1852	161	Applegate, Edwin	Bradford
1856	424	Arnold, Spencer	Maidstone
1850	352	Attfield, John	Walworth
1860	641	Bass, James	London
1850	393	Baxter, George	Chester
1857	491	Bearcroft, Richard James	Cheltenham
1856	437	Bell, William M.	Stonehouse
1860	635	Bell, William Henry	Whitehaven
1859	574	Benger, Frederick Benger	Harlow
1858	535	Birrell, David	Detroit, U. S.
1855	434	Bond, Charles Radcliffe	Ware
1859	587	Bothamley, Valentine	Newark
1856	615	Bourdas, Isaiah	London
1859	601	Brett, Robert	Bath
1853	581	Briggs, James Aston	Tipton
1860	626	Brooks, Frederick	Tunbridge Wells
1855	461	Brown, John	London
1858	536	Brown, Charles Hills	Devonport
1852	178	Buchanan, James	Edinburgh
1860	642	Burton, John	Nottingham
1853	568	Buzzard, Thomas Harley	Spilsby
1852	179	Cameron, William	Edinburgh
1853	636	Christian, John D.	Douglas
1859	582	Clapham, Edward	Leeds
1860	616	Clayton, Henry	Lewisham
1854	344	Clingan, William M.	Edinburgh
1852	205	Cobb, John Vinset	Deal
1853	543	Cocking, Thomas	Maldon
1848	226	Coles, Ferdinand	London
1853	457	Cutting, Thomas John	Selby
1856	531	Dallas, Clement	Woodbridge
1855	487	Davis, Richard	Walworth
1853	621	Dickins, Benjamin	Stratford-on-Avon
1859	627	Evans, John James	London
1856	418	Farr, Archer	Lambeth
1855	478	Fletcher, John	Camberwell
1857	492	Fowler, Charles Henry	London
1860	617	Francis, Robert D.	Bishop's Castle
1851	622	Frost, George	Derby
1853	511	Gill, Levi John	Bridport
1855	405	Goddard, George	Lowestoft
1857	495	Goldfinch, George	London
1856	512	Green, James	Bath
1860	628	Grieves, Austin S.	Ludlow
1856	455	Grimwood, William	Ipswich
1853	341	Grundy, Thomas	London
1857	569	Haines, John Jenkins	Bromsgrove
1855	404	Harden, Charles	Bristol
1860	623	Hardy, Samuel Croft	Birmingham

Year of Admission.	No. of Certificate.	NAME.	RESIDENCE.
1857	471	Harrow, Henry	Tunbridge Wells
1852	600	Harvey, Sidney	London
1857	493	Hawkes, James	Birmingham
1857	597	Holmes, William C.	London
1859	598	Hooper, Frank	London
1858	539	Hughes, Joshua	Crickhowell
1857	496	Hunneman, Charles Julius	Hanover
1847	56	Huskisson, William J.	London
1858	532	Ingall, Joseph	Wath-upon-Dearne
1860	629	Ismay, John George V.	Bristol
1852	184	Jamie, Robert	Edinburgh
1854	479	Jefferson, Thomas	Cambridge
1855	406	Johnson, Benjamin M.	Collumpton
1855	380	Jolley, Horace	London
1859	584	Jones, Robert William	Norwood
1853	338	Keeling, Thomas G.	Howden
1856	637	Kent, Frederick William	Southampton
1859	589	King, James	Bristol
1853	544	Laming, Welberry	Market Rasen
1854	345	Leighton, Thomas	Edinburgh
1855	399	Lloyd, David L.	Caernarvon
1860	638	Marriott, Frederick T.	Rugby
1860	618	Marten, Henry Oake	Newfoundland
1847	148	Matthews, William	London
1853	585	Maudsley, William	Preston
1860	630	Meadows, Henry	Gloucester
1858	533	Medwin, Aaron George	Greenwich
1859	631	Merrick, Charles James	Manchester
1849	91	Miller, Thomas L.	Blandford
1856	591	Monger, Hamilton Stacey	Stroud
1858	545	Moore, Francis Samuel	Bristol
1860	632	Morris, Henry	Liverpool
1858	506	Muskett, Edwin Burrell	Holt
1858	502	Nesbit, John	Berwick
1855	391	Nooten, Ernest Van	Edinburgh
1851	450	Nosworthy, Robert	Exeter
1860	643	Oliver, John Gerry	Holsworthy
1859	579	Paris, Thomas	Salisbury
1858	523	Partridge, William	Dudley
1856	452	Pearson, Edward Smith	Liverpool
1860	639	Poll, William Sheppard	Bungay
1855	611	Potts, Robert Alfred	London
1858	540	Rawling, John Wray	Wisbeach
1856	524	Rees, Thomas George	Pembroke Dock
1856	613	Reynolds, Freshfield	Guildford
1853	294	Rhind, William W.	Berwick
1853	498	Richards, Thomas Lewis	Chester
1856	430	Roberts, Owen	Pwllheli
1857	460	Robinson, John	Woolwich
1853	514	Robinson, William P.	Liverpool
1855	388	Routledge, Henry	London
1855	551	Sanger, William Albert	London
1857	481	Scott, Joseph Robinson	Sheffield
1853	453	Serpell, Samuel	Truro

Year of Admission.	No. of Certificate.	NAME.	RESIDENCE.
1857	508	Seymour, George	Oldbury
1858	578	Simpson, Henry David	Louth
1853	321	Simpson, Thomas	Walsall
1860	644	Sims, Francis M. B	Colchester
1858	509	Slack, John Lawrence	Ormskirk
1855	633	Spearing, James	Southampton
1853	268	Speechly, George	Peterborough
1852	413	Stedman, James	Lower Tooting
1856	423	Stewart, James	Kirkcaldy
1853	281	Stoneham, Philip	London
1857	645	Symes, Charles	Thornbury
1855	383	Taplin, George	Bath
1850	326	Tasker, William	London
1854	346	Thomson, John	Edinburgh
1857	473	Tieftrunk, Julius	London
1853	333	Todd, Thomas	Edinburgh
1851	144	Towl, Edward	London
1855	466	Tuck, John	Trowbridge
1855	624	Underdown, Frederick William	Canterbury
1856	640	Walsh, Edward	Maidstone
1849	125	Warner, John	London
1853	298	Watson, James	Montrose
1852	620	Watson, James B	Barking
1860	625	Watson, Frederick	Fakenham
1851	415	Watton, Edward	Manchester
1856	562	Waugh, Alexander	Southampton
1858	553	Weller, James William	Bloxwich
1850	646	Wells, Edwin	Ludlow
1858	529	Weston, Samuel John	Leicester
1857	500	Wigg, Henry John	Lynn
1856	432	Williams, Thomas	Carmarthen
1849	94	Willmott, Edwin	London
1858	566	Wilkinson, George	Manchester
1858	541	Wilson, Charles Wallace	London
1853	572	Young, John	Musselburgh
1859	563	Young, William	Banbury
1860	634	Young, Robert Fisher	Gringley-on-the-Hill

REGISTERED APPRENTICES.

Date of Registration.	NAME.	RESIDING WITH.	TOWN.
1857	Alderson, Frederick H.	Mr. Hempsted	St. Leonards
1859	Allanson, George.....	Mr. Allanson	Harrogate
1860	Allen, E. Ransome...	Messrs. Chapman, Bros....	Ipswich
1860	Allen, Samuel Stafford...	Mr. Beale	Hemel Hempstead
1857	Allison, Richard R.	Mr. Howorth	Doncaster
1858	Allott, Frederic	Mr. Greaves	Bakewell
1853	Ambrose, John D. L. ...	Mr. Farmer	Putney
1859	Amoore, Alfred Stares .	Messrs. Randall&Sons.	Southampton
1855	Andrews, Enos	Mr. Cropper	Long Sutton
1857	Appleton, Robert	Mr. Wilson.....	Sheffield
1857	Argles, Robert.....	Mr. Deane	Clapham
1858	Atherton, Charles Isaac.	Mr. Bromley	Liverpool
1853	Atkinson, George J.....	Mr. Wilson.....	Harrogate
1858	Atkinson, John P....	Messrs. Hurst & Morton..	Louth
1856	Atkinson, Edward F. ...	Mr. Kirton	Hull
1858	Atwood, John Charles...	Mr. Cracknell	London
1858	Backhouse, Noah.....	Mr. Rowntree	London
1858	Badcock, Henry	Mr. Peat	Lymington
1857	Bagshaw, James	Mr. Handley	Wakefield
1857	Baker, Thomas.....	Messrs. Groves & Son.	Blandford
1859	Bamber, John K. ...	Messrs. Savory & Moore...	London
1853	Barber, Tom.....	Mr. King.....	Rochester
1854	Barber, William	Mr. Nunn	Bury St. Edmunds
1857	Barlow, John Podmore..	Mr. Barlow.....	Manchester
1851	Bartlett, Ebenezer	Mr. Mather	Reading
1856	Barton, Frederick.....	Mr. Wilson.....	Bradford
1855	Batchelor, George H. W...	Mr. Watts	Chatham
1856	Bate, Henry	Mr. Davies	Chester
1860	Battman, Thomas.....	Mr. Wright	Manchester
1853	Beach, Thomas C.	Mr. Beach	Bridport
1854	Beach, Wesley	Mr. Beach	Bridport
1855	Beach, Tom Clarke	Messrs. Lea & Co....	Great Malvern
1860	Beale, Chas. George ...	Mr. Atkins	Salisbury
1860	Beale, Fred. Wilson ...	Mr. Atkins	Salisbury
1859	Beavan, Alfred James...	Mr. Matthews.....	London
1853	Beddard, John	Mr. Cross	Shrewsbury
1859	Bedford, Joseph	Mr. Bolton	Dover
1853	Bell, John.....	Mr. Sowerby	Carlisle
1857	Bell, James Alfred	Mr. Noakes	Brighton
1857	Bell, William	Mr. Cuthbert.....	Bedford
1855	Bennington, William ...	Mr. Mortimer.....	Sidmouth
1859	Benson, James Levett...	Mr. Dalwood	Sherbourne
1855	Bentley, William J.....	Mr. Pryer	Axminster
1859	Berrell, Charles	Mr. Farmer.....	London
1854	Bingley, Frederick B. ...	Mr. Tanner.....	Exeter
1855	Birch, Henry C.	Mr. Clarke	Richmond
1854	Bird, David L.	Mr. Wilson.....	Canterbury
1854	Bishop, William	Mr. Gay	Stroud
1859	Blackbourne, Henry J...	Mr. Jeffery.....	Horncastle
1858	Bland, Percy Owen	Mr. Fox	London
1845	Blaxall, Arthur S.....	Mr. Blanchflower.....	Loddon

Date of Registration.	NAME.	RESIDING WITH.	TOWN.
1858	Blundell, Joseph A.	Mr. Groves	Weymouth
1859	Bolton, Edgar Benj.	Mr. Fairbank	Woolwich
1860	Bonnett, Frederick	Mr. Price	Bridgend
1859	Bourdas, John	Mr. Bourdas	London
1860	Bowen, John Thomas	Mr. Parker	Bath
1856	Bowler, Harvey F.	Mr. Hitchcock	Colchester
1860	Boyd, John	Mr. Cornish	Brighton
1854	Bradley, Edwin S.	Mr. Parker	Derby
1858	Bradley, John Perry	Mr. Parker	Birmingham
1860	Braggs, Robert William.	Mr. Anness	Ipswich
1856	Brayshay, Thomas	Mr. Brayshay	Stockton
1857	Brereton, Matthew B.	Mr. Mabson	Yarmouth
1856	Brew, John Archer	Mr. Brew	Brighton
1859	Bridges, Charles Wm.	Mr. Biscoe	London
1856	Brock, George Walter	Mr. Fairbank	Woolwich
1856	Brooks, Saml. Brewer	Mr. Lawton	Wakefield
1853	Brown, Charles B.	Mr. Thorne	Bedford
1855	Brown, William H.	Mr. Corder	North Shields
1856	Brown, John	Mr. Forge	Driffield
1857	Brown, Edward	Mr. Dutton	Birkenhead
1860	Brown, James	Messrs. Gardner & Ainslie	Edinburgh
1860	Browne, James	Mr. West	Coventry
1860	Browne, Thomas L.	Mr. Higgins	Chester
1856	Browne, John Edwin	Mr. Bartlett	Chelsea
1860	Bullock, Frederick	Mr. Parkes	Manchester
1853	Burdock, James	Mr. Reading	Warwick
1856	Burt, James	Mr. Allanson	Harrogate
1856	Burton, John	Mr. Parker	Derby
1854	Burton, Joseph	Mr. Wick	Sheffield
1858	Butler, Edward D. B.	Mr. Penney	Poole
1859	Butler, Edwin	Mr. Dowman	Southampton
1857	Campbell, Robert	Mr. Mackay	Galashiels
1859	Canning, Charles W.	Mr. Keene	Leamington
1858	Capern, Alfred	Mr. Anthony	Bedford
1860	Carr, John	Mr. Scarrow	Sunderland
1857	Carre, Louis C. A.	Mr. Tylee	Bath
1855	Carrington, Ebenezer T.	Mr. Toone	Warminster
1859	Carter, Thomas	Mr. Dresser	York
1855	Cartner, David	Mr. Bell	Carlisle
1860	Carty, Michael	Mr. Radermacher	London
1854	Chambers, William	Mr. Dresser	York
1855	Chapman, Francis C.	Mr. Green	Droitwich
1855	Clarke, Willoughby	Mr. Brown	Oxford
1858	Clarkson, Sidney	Mr. Macarthy	Romford
1860	Clayton, F. C.	Messrs. Harvey & Reynolds	Leeds
1858	Colby, John	Mr. Colby	Brighton
1857	Cole, Alfred	Mr. Groves	Hammersmith
1859	Coles, John William	Mr. Coles	Camberwell
1858	Collier, William	Mr. Collier	Sheffield
1859	Conder, George	Mr. Smith	Walworth
1855	Cooper, Frederick	Mr. Cooper	Leicester
1859	Cooper, Henry	Mr. White	Nottingham
1853	Cornish, Thomas R.	Mr. Cornish	Penzance
1856	Cornish, William	Mr. Cornish	Brighton

Date of Registration.	NAME.	RESIDING WITH.	TOWN.
1854	Coulson, Henry	Mr. Coulson	Scarborough
1855	Coulthard, Christopher	Mr. Harrison	Carlisle
1858	Coward, John Senior	Mr. Butler	Pontefract
1854	Cozens, William	Mr. May	Reading
1854	Crease, James R.	Mr. Mackay	Edinburgh
1853	Crussell, James W.	Mr. Cooper	London
1858	Curtis, Albert Augustus	Mr. Churchouse	Chard
1860	Dale, George	Mr. Hughes	Altrincham
1854	Dalrymple, William	Mr. Luff	Oxford
1858	Davenport, John M.	Mr. Davenport	London
1857	Davies, Robert John	Mr. Roberts	London
1858	Davies, William	Mr. Coleman	Cardiff
1856	Davison, William	Mr. Greaves	Bakewell
1858	Dawson, James Henry	Mr. Telfer	Oxford
1855	Dawson, John	Mr. Goddard	Yarmouth
1859	Dawson, Oliver Robert	Mr. Smith	Southampton
1855	Dean, Samuel	Mr. Fox	London
1858	Denne, Henry	Mr. Kingdon	London
1858	Dodshon, Edward	Mr. Dodshon	Sunderland
1857	Doughty, Edward T.	Mr. Doughty	London
1860	Douglas, Archibald H.	Messrs. Argles & Co.	Maidstone
1853	Dowsett, Arthur	Mr. Baker	Chelmsford
1856	Draper, Henry Foulger	Mr. Arnold	Norwich
1858	Dumolo, John Thomas	Mr. Parker	Birmingham
1853	Earland, William	Mr. Davies	Hay
1859	Earnshaw, Benj. King	Messrs. Garratt	Rugby
1856	Eason, John	Mr. Gilkes	Leominster
1857	Edwards, Frederick H.	Mr. Medcalf	Lower Tooting
1860	Edwards, William	Mr. Horton	Much Wenlock
1859	Ekin, Charles	Messrs. Argles & Co.	Maidstone
1854	Eland, Edward F.	Mr. Telfer	Oxford
1853	Elliott, Robert John	Mr. Steward	Yarmouth
1859	Elliott, Robert	Messrs. Proctor & Son	Newcastle
1859	Ellis, Henry Brook	Mr. Collins	Bristol
1856	Eminson, John	Mr. Marshall	Gainsborough
1853	Evans, William	Mr. Ferris	Bristol
1857	Evans, Alfred Paget	Mr. Cutting	Leamington
1853	Evans, Edward	Mr. Bancroft	Ruthin
1857	Eve, Charles	Mr. Wilson	Holloway
1854	Fairley, Robert	Mr. Mackay	Edinburgh
1860	Fancourt, John	Mr. Lavers	Blackheath
1856	Farrar, William	Mr. Heming	Sunderland
1859	Ferneley, J. William	Mr. Gamble	Grantham
1854	Fidel, Albert J.	Mr. Telfer	Oxford
1857	Foggitt, Thomas	Mr. Smeeton	Leeds
1852	Foster, Michael E.	Mr. Sturton	Peterborough
1854	Foster, Thomas U.	Mr. Weston	Sleaford
1856	Fox, Edward M.	Mr. Michell	Falmouth
1853	Fresson, William	Mr. Fresson	Stevenage
1858	Fuller, Thomas G.	Mr. Fuller	Burntisland, N.B.
1853	Gething, William	Mr. Tomlinson	Lincoln
1857	Gibbs, Thomas	Mr. Steward	Yarmouth
1851	Gilliatt, William	Mr. Gamble	Grantham
1859	Gillies, Wm. Jonathan	Mr. Dunn	St. Austell
1855	Goodchild, Nathaniel	Mr. Wood	Brighton

Date of Registration.	NAME.	RESIDING WITH.	TOWN.
1859	Goodwin, Medmer	Mr. Telfer	Oxford
1855	Goodwyn, Charles S.	Mr. Chapman	Ipswich
1860	Gray, Thomas	Mr. Banks	Birmingham
1859	Greaves, Wm. Samuel	Mr. Greaves	Ironville
1860	Green, Edwin G.	Mr. Greaves	Bakewell
1855	Gregory, Richard	Mr. Lavers	London
1858	Greig, Francis	Mr. Mackay	Edinburgh
1855	Grigor, William	Mr. Macfarlan	Edinburgh
1853	Gunn, Frederick T.	Mr. Cross	Shrewsbury
1859	Hadley, Thomas	Mr. Harris	Hereford
1856	Halsey, Bennet	Mr. Husband	Exeter
1854	Ham, Charles	Mr. Foster	Collumpton
1860	Hamilton, Herbert B.	Mr. Savage	Brighton
1854	Harley, Edward	Mr. Foster	Ludlow
1858	Harper, Wm. James.	Mr. Gent	Macclesfield
1860	Harris, Henry Wm.	Messrs. Ford & Miller	Reading
1856	Harrison, Stephen	Mr. Breary	Douglas
1853	Haslam, Frederick B.	Mr. Dakin	Poplar
1858	Hasselby, Thomas J.	Mr. Chantry	Goole
1856	Hatch, Richard M.	Mr. James	Bognor
1857	Hatchard, Stephen	Mr. Huggins	Alresford
1859	Hatchett, Thomas	Mr. Hemingway	London
1856	Head, John T.	Mr. Head	Lewes
1857	Heald, Alfred John	Mr. Barley	Wisbeach
1853	Herbert, Henry	Mr. Groves	Blandford
1859	Hickman, William	Messrs. Argles & Co.	Maidstone
1857	Highway, Matthew H.	Mr. Caddick	Newcastle-u.-Lyne
1843	Hill, William	Mr. Rowe	Plymouth
1857	Hill, Francis	Mr. Reinhardt	Leeds
1857	Hoare, James Raper	Mr. Gigner	Chelsea
1852	Hodgkinson, John S.	Mr. Brooker	Macclesfield
1859	Holgate, Walter	Mr. Barber	Liverpool
1856	Holland, William	Mr. Sibary	Longton
1859	Holmes, John Thomas	Mr. Botham	Manchester
1859	Holmes, E. Morell	Mr. Hayward	Chelsea
1855	Holmwood, William C.	Mr. Coppock	Bridport
1855	Holt, George F. W.	Mr. Obbinson	Sleaford
1856	Holt, William Henry	Mr. Paulden	Altrincham
1858	Hopgood, Rich. Cooper.	Mr. Hopgood	Chipping Norton
1854	Horn, William	Mr. Longrigg	Appleby
1860	Hoskyn, Montague J.	Mr. Pearce	Southampton
1859	Hudson, John William	Mr. Pratt	Bradford
1859	Hughes, Thomas Jones.	Mr. Hughes	Holyhead
1858	Hughes, Griffith Hugh	Mr. Hughes	Holyhead
1854	Humphries, Henry A.	Mr. Grounds	Ludlow
1852	Hunter, George	Mr. Garbutt	Gateshead
1853	Hustwick, Thomas H.	Mr. Coupland	Harrogate
1857	Iliffe, Frank	Mr. Brown	Coventry
1843	Ince, Joseph	Mr. Ince	London
1859	Isherwood, James	Mr. Greenwell	London
1858	Ive, William	Mr. Lawrence	Kensington
1856	Jackson, Warwick	Mr. Hitchcock	Colchester
1856	Jackson, John	Messrs. Wilson & Co.	Bradford
1855	Jakins, George S.	Mr. Golding	London

Date of Registration.	NAME.	RESIDING WITH.	TOWN.
1853	James, Robert	Mr. Fletcher	Nottingham
1860	Jelly, Stephen J.	Mr. Simpson	Hull
1859	Jones, Jas. Davenport	Mr. Marston	Ludlow
1859	Jones, John Reed	Messrs. Garratt	Rugby
1860	Jones, Hugh	Mr. Bancroft	Ruthin
1853	Jones, Oliver	Mr. Roberts	Bourne
1860	Judson, Charles W.	Mr. Judson	Ripon
1856	Kemp, Francis	Mr. Smeeton	Leeds
1851	Kent, William Henry	Mr. Buck	Colchester
1860	King, James Hurman	Mr. Stroud	Bristol
1854	Knight, John A.	Mr. Arnold	Norwich
1858	Knowles, John Hiles	Mr. Anthony	Bedford
1857	Lacey, Walter	Mr. Meredith	Bristol
1855	Lamplough, John	Mr. Stevenson	Derby
1857	Langley, William	Mr. Tylee	Bath
1859	Laurens, F. Lempriere	Messrs. Ereaut	Jersey
1857	Lavers, Thomas F.	Mr. Lavers	Lewisham
1853	Lawrence, George	Mr. Wright	London
1853	Le Feuvre, Francis	Mr. Ereaut	Jersey
1858	Leppard, James	Mr. Williams	Horsham
1859	Lescher, F. H.	Messrs. Evans, Lescher, & Evans.	London
1860	Llewellyn, Peter	Mr. Phillips	Carmarthen
1859	Lightfoot, John	Mr. Shepheard	Chester
1860	Lindley, Wm. Walker	Mr. Evans	Swansea
1860	Livermore, George	Mr. Goodger	London
1859	Lock, Edward	Mr. Haydon	Fordingbridge
1857	Lovatt, John Hammond.	Mr. Wilshaw	Wordsley
1859	Lucas, Philip John	Mr. Martin	Guildford
1857	Machon, Edward	Mr. Parkes	Manchester
1860	Maine, Philip B.	Mr. Wills	Barnstaple
1855	Malin, Edmund C. M.	Mr. Huggins	Barnet
1859	Manby, Thomas	Mr. Chenery	Ipswich
1850	Manthorp, George	Mr. Manthorp	Colchester
1847	Marrack, George M.	Mr. Searle	Crediton
1852	Marrack, Philip	Mr. Searle	Crediton
1856	Martin, James	Mr. Palk	Southampton
1857	Martin, Benjamin	Mr. Handley	Wakefield
1859	Martin, Frederick	Mr. Candler	Margate
1860	Martindale, William	Mr. Thompson	Carlisle
1857	Mason, John	Mr. Mason	Hastings
1857	Mathias, Thomas	Mr. Jones	Narberth
1853	Matthews, Charles	Mr. Gostling	Diss
1858	Maudson, Joseph W.	Mr. Maunder	Sheffield
1855	May, Augustus S.	Mr. Greenwell	London
1855	McCabe, Dunbar	Mr. Macfarlan	Edinburgh
1858	MacGeorge, William	Mr. Carruthers	Dumfries
1859	Metcalfe, John Sykes	Mr. Marsden	Preston
1859	Metcalfe, Chas. J.	Mr. Maitland	London
1857	Midgley, John James	Mr. Reinhardt	Hull
1858	Midgley, Charles	Mr. Rimmington	Bradford, York
1858	Midgley, J. E.	Messrs. Lynch & Wilkinson.	Manchester
1856	Miller, Duncan S.	Mr. Pooley	Bath
1859	Miller, Thomas Henry	Mr. Jackson	Crediton
1856	Mohun, Martin	Messrs. Argles & Co.	Maidstone

Date of Registration.	NAME.	RESIDING WITH.	TOWN.
1858	Monkhouse, Joshua	Mr. Davies	Gainsborough
1857	Moore, Abraham	Mr. White	Birmingham
1856	Morley, Edward	Mr. Asling	Spalding
1856	Morley, George	Mr. Wheeler	Hackney
1860	Morris, William	Mr. Hardman	Kirkham
1859	Moysey, William	Mr. Moon	Ilfracombe
1853	Moverley, Robert	Mr. Dingley	Maidstone
1857	Murrell, John Friday	Mr. Maynard	Brandon
1856	Newby, John	Mr. Hughes	Altrincham
1860	Norrish, Henry	Mr. Jackson	Crediton
1859	Oliver, Robt. Dawson	Mr. Smith	Southampton
1858	Olliver, George E.	Mr. Groves	Weymouth
1847	Orpe, Thomas M.	Mr. Watton	Derby
1849	Ough, William	Mr. Jeffery	Devonport
1856	Overton, William	Mr. Fowke	Stafford
1852	Owles, James John	Mr. Owles	Yarmouth
1860	Parkes, Robert	Mr. Townsend	Burton-upon-Trent
1858	Parry, William	Mr. Christopher	Crickhowell
1859	Pasmore, Fred. Rich.	Mr. Pasmore	Chelsea
1859	Payne, Sidney	Mr. Kendall	Stratford-on-Avon
1858	Pearcey, Herbert A.	Mr. Biggs	London
1858	Phillips, Jonathan	Mr. Christian	Godalming
1859	Philpot, Arthur Walter	Mr. Wimble	Maidstone
1858	Pickup, Robt. Lansdale	Mr. Pickup	Manchester
1859	Picton, John T.	Messrs. Picton & Hatton	Warrington
1858	Pissey, William F.	Mr. Pissey	Rayleigh
1857	Pistrucci, Filippo	Mr. King	London
1855	Pitman, John	Mr. Fendick	Bristol
1859	Postans, Arthur Wm.	Mr. Banfield	Bury St. Edmunds
1854	Power, Thomas M.	Mr. Williams	Nottingham
1858	Pratt, Henry	Mr. Loggin	Stratford-on-Avon
1859	Pratt, Albert Edward	Mr. Smith	Bury St. Edmunds
1860	Pratt, Joseph	Mr. Loggin	Stratford-on-Avon
1857	Price, Thomas	Mr. Laen	Pembroke Dock
1857	Pritchard, George F.	Mr. Barnes	Knightsbridge
1860	Provost, John Arthur	Mr. Chaston	Lowestoft
1857	Prust, Richard	Mr. Brend	Swansea
1858	Pryce, Alfred C.	Messrs. Picton & Hatton	Warrington
1858	Pullin, William H.	Mr. Parkes	Atherstone
1853	Quinlan, Joseph	Mr. Times	London
1855	Rae, John Inglis	Mr. Mackay	Edinburgh
1858	Rainnie, Alexander	Mr. Stewart	Edinburgh
1859	Rastrick, Robert Joseph.	Mr. Rastrick	Southsea
1858	Rayner, Gilmour G.	Mr. Brend	Swansea
1856	Rea, James Parker	Mr. Rea	London
1857	Reed, Alfred	Mr. Gordelier	Sittingbourne
1860	Richardson, Joseph H.	Messrs. Balkwill & Sons	Plymouth
1859	Richardson, Richard	Messrs. Carruthers	Dumfries
1853	Rickards, Edwin	Mr. Grieves	Ludlow
1859	Ridding, William	Mr. Marris	London
1860	Rider, Frederick	Mr. Tippett	London
1852	Riley, James	Mr. Smith	Sutton Coldfield
1858	Ritchie, John Moffat	Mr. Medley	Derby
1852	Rivers, Henry	Mr. Hornsby	Odiham

Date of Registration	NAME.	RESIDING WITH.	TOWN.
1856	Roberts, John L.	Mr. Sibary	Longton
1859	Roberts, Charles	Mr. Handley	Wakefield
1859	Robertson, A. G.	Messrs. Macfarlan & Co.	Edinburgh
1857	Robinson, James F.	Messrs. Picton & Hatton	Warrington
1859	Rochford, Percy	Mr. Burden	London
1858	Romans, Thomas	Mr. Cutting	Selby
1860	Rose, Alfred	Mr. Dakin	London
1856	Rosselloty, John C.	Mr. Couch	Islington
1857	Rowell, Joseph	Messrs. Sturton & Son	Peterborough
1853	Salmon, Henry L.	Mr. Moore	Brighton
1860	Saul, William Benjamin.	Mr. Pring	Taunton
1857	Savage, W. Wallace	Mr. Savage	Brighton
1859	Savage, George Henry	Mr. Savage	Brighton
1846	Savory, Thomas H.	Mr. Savory	London
1846	Savory, Charles H.	Mr. Savory	London
1854	Saxby, Henry	Mr. Saxby	Lewes
1860	Saxby, Robert	Mr. Saxby	Lewes
1857	Scott, James Furness	Mr. Smith	Dunstable
1859	Scruby, William Yull	Mr. Pertwee	Romford
1857	Seaton, Charles A.	Mr. Hill	Sherborne
1859	Shadford, Thomas	Mr. Shadford	Spalding
1855	Shaw, Ward	Mr. Lofthouse	Hull
1858	Shaw, Benjamin	Mr. Gissing	Wakefield
1860	Shephard, T. F.	Messrs. Schweitzer & Co.	Brighton
1854	Shepley, Samuel	Mr. Claughton	Chesterfield
1857	Sheriff, Thomas	Mr. Macfarlan	Edinburgh
1855	Simpson, Thomas	Mr. Allen	Boston
1859	Simpson, A. Lankester	Mr. Simpson	Stowmarket
1854	Slater, Henry	Mr. Asling	Spalding
1856	Slator, Thomas	Mr. Pilley	Boston
1856	Smart, Benjamin	Messrs. Lea and Co.	Worcester
1852	Smith, Edward	Mr. Lynch	Manchester
1852	Smith, William	Mr. Sumner	Birmingham
1853	Smith, Frank de Carle	Mr. Wright	London
1854	Smith, Frederick	Mr. Foster	Ludlow
1844	Smith, James W.	Mr. Coulson	Scarborough
1859	Smith, George Henry	Mr. Tonge	York
1859	Smith, Hubert	Mr. Luff	Oxford
1860	Smith, Thomas Hoskins.	Mr. Rook	Sittingbourne
1860	Smith, Herbert Geo.	Mr. Witherington	Worcester
1860	Smith, Rawson	Mr. Davis	High Harrogate
1859	Smyth, Samuel Walton	Mr. Sims	Barnsbury
1858	Soole, Seymour Henry	Mr. Jessopp	Bishop Stortford
1860	Sproat, Robert	Mr. Parker	Derby
1858	Stanley, Robert Swan	Mr. Wortley	Durham
1854	Stanway, William H.	Mr. Blandford	London
1857	Stapleton, Thos. Glode.	Mr. Collins	London
1856	Stokes, Edward H.	Messrs. Lea and Co.	Malvern
1859	Stokes, Walter Edw.	Mr. Boully	London
1857	Stone, George	Mr. Tonge	York
1858	Stretton, Charles	Mr. Parker	Derby
1853	Sturges, William T.	Mr. Gudgen	Kimbolton
1855	Sturton, John R.	Mr. Sturton	Peterborough
1857	Swinnerton, William	Mr. Woods	Worcester

Date of Registration.	NAME.	RESIDING WITH.	TOWN.
1857	Syer, John Witham	Mr. King	Soham
1859	Sutcliffe, J. Clarkson	Mr. Strachan	Barnsley
1856	Tanner, Augustus F.	Mr. Dickinson	London
1857	Taylor, George Spratt	Mr. Coupland	Harrogate
1855	Teed, David	Mr. Pasmore	Exeter
1854	Thomas, George S.	Mr. Outhwaite	Bradford
1856	Thomson, Denzil	Mr. Witherington	Worcester
1858	Thomson, George G.	Messrs. Macfarlan	Edinburgh
1858	Tilden, William A.	Mr. Allchin	London
1858	Tolbert, Thos. W. H.	Mr. Froud	Dorchester
1860	Topliss, Richard	Mr. Breary	Douglas
1857	Touzeau, James Fred.	Mr. Arnold	Guernsey
1857	Touzeau, John Arnold	Mr. Arnold	Guernsey
1856	Towerzey, Alfred G.	Mr. Towerzey	London
1857	Trewavas, Richard J.	Mr. Job	Truro
1856	Trotter, Joseph	Mr. Brown	York
1857	Truman, George F.	Mr. Wellington	Oakham
1853	Turner, John	Mr. Payne	Aylesbury
1856	Twinberrow, James K.	Mr. Twinberrow	London
1858	Umney, Charles	Mr. Corrie	Bedford
1859	Vacher, A.	Messrs. Bullock & Reynolds	London
1855	Vooght, William	Mr. Twinberrow	London
1846	Wakefield, Cecil H.	Messrs. Lea & Co	Worcester
1849	Walker, Charles	Mr. Walker	Hogsthorpe
1854	Walker, Joseph	Mr. Witherington	Worcester
1857	Walker, George	Mr. Goodall	Derby
1859	Walker, William	Mr. Headley	Bridlington Quay
1857	Wall, John Thomas	Mr. Butcher	Cheltenham
1853	Walls, Thomas	Mr. Barber	Liverpool
1851	Walters, William	Mr. Tanner	Exeter
1855	Walton, Ralph	Mr. Ritson	Sunderland
1860	Ward, Joseph	Mr. Iliffe	Nuneaton
1859	Warland, Francis W.	Mr. Penney	Poole
1857	Warren, Thomas P. B.	Mr. Pasmore	Exeter
1860	Warren, George Robert.	Mr. Harris	Ware
1858	Waters, Alexander	Mr. Corrie	Bedford
1860	Watkins, Richard	Mr. Fowler	London
1857	Watson, Richard T.	Mr. Dobinson	Bishopwearmouth
1857	Watson, Thomas D.	Messrs. Martindale & Son	Carlisle
1857	Watts, John Newton	Mr. Watts	London
1860	Watts, John	Mr. Fincham	London
1859	Wearing, R. Hodgson	Mr. Wearing	Liverpool
1857	Webber, Charles F.	Mr. Edwards	Sidmouth
1859	Webster, George O	Mr. Seddon	Manchester
1858	Webster, George W.	Mr. Webster	Warrington
1853	Wheeler, James	Mr. Payne	Aylesbury
1855	Wheeler, Joseph	Mr. Owen	London
1856	White, John G.	Mr. Ransome	Hitchin
1856	White, James W.	Mr. Iverach	Kirkwall
1859	White, Alfred	Mr. Mount	Canterbury
1856	Whitehouse, George H.	Mr. Tonge	York
1853	Whitworth, John	Mr. Lowe	Liverpool
1857	Wigginton, Joseph	Mr. White	Nottingham
1858	Willan, James R.	Mr. Pratt	Wolverhampton

Date of Registration.	NAME.	RESIDING WITH	TOWN.
1850	Willcox, John W.	Mr. Hollier	Dudley
1853	Williams, Frederick	Mr. Anderson	Worcester
1860	Williams, W. P.	Messrs. Williams & Fitzhugh	Nottingham
1856	Willsher, Stephen Henry	Mr. Bolton	Tenterden
1852	Wilson, William	Mr. Rainey	Spilsby
1859	Wilson, Francis	Mr. Lord	Rochdale
1856	Witherington, Henry	Mr. Witherington	Worcester
1853	Wood, Edmund	Mr. Pooley	Bath
1854	Wood, John Robert	Mr. Simmonds	Boston
1857	Wood, Albert	Mr. Watkins	Walsall
1858	Wootton, Alfred C.	Mr. Wootton	Luton
1858	Wyman, John	Mr. Gulliver	Lutterworth
1855	Yerworth, Edmund	Mr. Binge	Pimlico
1857	Young, John	Mr. Mackay	Galashiels

THE PHARMACEUTICAL JOURNAL.

SECOND SERIES.

VOL. II.—No. II.—AUGUST 1st, 1860.

EDUCATION AND EXAMINATION.

In the discussion of questions relating to the educational objects of the Pharmaceutical Society, it has frequently been assumed that while the Society maintains a School of Pharmacy, and is thus identified with the active duties of education, it cannot hope to obtain any extensive power, as an examining body, for the granting of licenses to practice Pharmacy; and reference has been made, in support of such position, to the case of the London University, now called University College. The projectors of this College proposed to create an educational establishment, affording the advantages of a university education, with power to grant degrees in the faculties of Arts, Laws, and Medicine. On going to Parliament for this power, however, the application was refused, or at least was not granted; the establishment in Gower Street was not allowed to be both an educating and examining body, its duties were restricted to education, and the name was changed from London University to University College, while, at the same time, a new body was created, under the title of "University of London," the objects of which were, "the advancement of religion and morality, and the promotion of useful knowledge, by holding forth to all classes of her Majesty's subjects, without any distinction whatsoever, an encouragement for pursuing a regular and liberal course of education, by offering to persons who prosecute or complete their studies in the metropolis or in other parts of the United Kingdom such facilities, and conferring on them such distinctions and rewards, as may incline them to persevere in their laudable pursuits; and for the purpose of ascertaining, by means of examination, the persons who have acquired proficiency in literature, science, and art, by the pursuit of such course of education, and of rewarding them by academical degrees, as evidence of their respective attainments, and marks of honour proportioned thereunto."

The formation of the London University, now University College, commenced in 1825; the foundation-stone of the building was laid in April, 1827; a Charter of Incorporation was applied for in April, 1830; and from that time until 1836, successive but ineffectual efforts were made to obtain by Royal Charter or Act of Parliament the required powers. The result of these efforts is generally known and frequently referred to, but the cause of failure in the applications made to the Crown and to Parliament is frequently lost sight of, and hence a very erroneous conclusion is sometimes drawn, with reference to the bearing of this case upon the establishment of educational institutions, with power to examine their own students and grant degrees or certificates having a legal recognition.

In opposition to the opinion sometimes expressed, that it is inconsistent with the principles of modern legislation to make the same institution at once an educating and an examining body, it might be urged that these two functions

have been conferred upon the Pharmaceutical Society by Royal Charter and by Act of Parliament. The result of experience in reference to this Society, therefore, tends to show that the exercise of the two functions by the same body does not necessarily involve anything inconsistent with the principles of modern legislation. This opinion is also confirmed by reference to many other cases, and even in the case of University College it is found, upon inquiry into all the circumstances, that the grounds of opposition to the granting of the powers originally sought for, were not such as is assumed in the statement above made.

The opposition first raised to the incorporation of the London University with the power of conferring academical distinctions, originated with the Universities of Oxford and Cambridge, the two oldest institutions of the sort in the country, and themselves possessing and exercising similar powers. This opposition did not arise until the Charter, as prayed for, had gone through nearly all its forms, and, but for this interference, there can be no doubt that the powers asked for would have been freely granted. In the face of such opposition, however, the completion of the Charter was stayed, and no further proceedings were taken in reference to it until three years afterwards, when in 1833 the application was renewed. At this time the opposition, which was again offered, had acquired new strength. It comprised not only the two old Universities, which on the previous occasion were the only opponents, but also the Royal College of Surgeons of London, and the teachers of medicine and surgery in the hospitals of the metropolis. The grounds of opposition on the part of these bodies were very different.

The petition presented by the University of Oxford set forth "that serious injury would accrue to numerous ancient institutions, and much consequent evil to the public, if a right to confer any academical distinctions, designated by the same titles, or accompanied with the same privileges as the degrees of the Universities of Oxford and Cambridge, should be given by Royal Charter, either expressly or by implication, *to a Society which had no immediate connexion with the Established Church, and taught no system of religion.*" This was the principal ostensible ground of opposition on the part of the old Universities. It was stated in argument before the Privy Council, that the Crown could not grant the Charter prayed for, because the new University, as such, would necessarily be subject to visitation by the Archbishop of Canterbury, and such visitation could not consistently be made to an institution in which the doctrine of the Church of England was not taught. A charge of indifference to religion had frequently been urged against the new Institution; its supporters, although comprising many members of the peerage, some of the most eminent legislators of the day, men of rank and distinction, and members of the Church of England, were reproached with inculcating infidelity, because religion did not form part of the instruction given in this new school; and this was used to strengthen the argument now advanced in opposition to the granting of the Charter.

Another ground of objection was the joint-stock character of the association of subscribers to the Institution. The fund for establishing the University was principally raised by the sale of shares, one hundred and sixty thousand pounds having been thus invested by eleven hundred shareholders, in shares of one hundred pounds each. It was urged against the granting of the charter, that it would be derogatory to the dignity of the Crown to grant a Charter as prayed to a body such as this, who might seek, by conferring academical distinctions on easy terms, to enhance the market value of the shares in the Institution.

The strongest objections, however, were those urged by the teachers in the medical and surgical schools already existing in the metropolis, who represented

the injury that would be done to their interests as teachers, from the advantage over them that would be enjoyed by the London University as a school of medicine if it should receive the power of conferring degrees.

The whole of the objections urged against the establishment of the London University, as originally designed, may be said to have been founded partly on religious grounds, and partly on those of vested interests.

After the hearing of the petitioners both for and against the Charter by the Privy Council, the consideration of the subject was adjourned, and no decision was given. In 1835, the subject still remaining undecided, a motion was made in the House of Commons, by Mr. W. Tooke, for an address to the Crown, praying that a Charter of Incorporation might be granted to the University of London, containing no other restriction than against conferring degrees in divinity. This motion was carried against the ministry by a majority of 110 members in a full house. The reply of the King was to the effect that the Privy Council should be called on without delay for a report of the proceedings in the matter, in order that his Majesty might be enabled to judge what would be the best mode of carrying out the wishes of his faithful Commons, and what might be the conditions with which the grant of a Charter to the University of London ought to be accompanied.

After some further delay, a proposition was made by the Government to incorporate by Royal Charter, as a University of London, a body of gentlemen of eminence in learning and science, who should have the power of examining candidates, and of conferring degrees in Arts, Medicine, and Laws, on students of certain colleges in London therein named, and others existing throughout the country to be afterwards recognized, as well as the schools of professional education. This University was to be supported by an annual vote of money by Parliament, and the degrees were to be conferred on persons of all religious persuasions without distinction, and without the imposition of any test or disqualification whatever. At the same time, a Charter was to be granted to the then existing University as a College, and it was to be recognized as one of the schools entitled to send up students for examination at the new University.

This proposition was at once accepted by the supporters of the original Institution as a satisfactory settlement of the question in dispute, the objects they had in view being provided for even more completely than they would have been by the plan they had themselves suggested.

It will thus be seen that the circumstances under which the power of granting degrees was refused to the London University, now University College, afford no grounds for concluding that the exercise of this function by an educational body is considered to be incompatible with that of teaching. In this respect, the constitution of the University of London as now existing is, in fact, an exception to the general rule, the Universities of Oxford, Cambridge, Durham, Edinburgh, &c., being institutions where both education and examination are conducted by the same bodies.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, 4*th July*, 1860,

Present—Messrs. Bird, Bottle, Bucklee, Davenport, Deane, George Edwards, Evans, Hills, Hollier, Lescher, Macfarlan, Morson, Sandford, Squire, and Waugh—

Mr. James Wilson.....EDINBURGH
was elected a **MEMBER.**

MAJOR EXAMINATION, 17*th July*, 1860.

Bell, William Henry.....Whitehaven
Cutting, Thomas John.....Selby
Grieves, Austin Stirling .....Ludlow
Johnson, Benjamin Musgrove.....Collumpton
Jones, Robert William.....Greenwich
Underdown, Frederick William.....Canterbury
Walsh, Edward .....Maidstone
Waugh, Alexander .....Southampton

MINOR EXAMINATION.

Hodges, William .....Ramsgate
Hodgkinson, Charles .....Leicester
Holmes, Edward Morell .....Chelsea
Hughes, Hugh Griffith.....Holyhead
Mohun, Martin .....Maidstone
Saxby, Henry .....Lewes

REGISTERED APPRENTICE.

NAME.	RESIDING WITH.	ADDRESS.
Wills, Douglas	Mr. Baker	Lewisham

SUBSCRIPTIONS TO THE JACOB BELL MEMORIAL—(*Continued*).

Amount previously advertised, £1841 2*s.* 6*d.*

	£	s.	d.
Herapath, William, F.C.S., Bristol	1	1	0
Whiteside, J. W., D.D., Scarborough	1	1	0
Bowerbank, Edward, and Son, Distillery, Sun Street, Bishopsgate	10	10	0
Bowerbank, S., F.R.S., 3, Highbury Grove	5	5	0
Foster, J., Collumpton	1	1	0
Frith, W. P., R.A., 10, Pembridge Villas	3	3	0
Bell, Thomas, F.R.S., President of the Linnæan Society ...	1	1	0

PROVINCIAL TRANSACTIONS.

LIVERPOOL CHEMISTS' ASSOCIATION.

The Nineteenth and last Meeting of the Session was held in the Royal Institution, Colquitt Street, on June 28th,

THE PRESIDENT IN THE CHAIR.

The Secretary laid on the table roots of *Convallaria multiflora* and *Bryonia dioica*.

The President, in a few introductory remarks upon the value and importance of diligence in study by the young Pharmaceutist during the early part of his career, presented the "President's Prize" to the successful competitors for the best answers at the examination of the Pharmacy class. The first prize, two vols. Miller's *Chemistry*, handsomely bound, was awarded to Mr. Job Preston; and the second prize, Dr. Christison's *Treatise on Poisons*, also handsomely bound, to Mr. James Whiteside Wade.

Mr. Abraham introduced to the notice of the meeting a specimen of coloured vulcanized India-rubber, which was now used by several dentists for mounting artificial teeth instead of gold.

The President read a paper "On Deviations from the Pharmacopœia," and alluded to several preparations, including Confection of Senna, Spirit of Nitre, Precipitated Sulphur, &c. A short discussion followed, after which the President made a few valedictory observations, terminating the Session.

Mr. Mercer proposed a vote of thanks to the President (Dr. Edwards) for his valuable services to the Association during the Session, which was carried by acclamation.

ORIGINAL AND EXTRACTED ARTICLES.

NOTES ON CHINESE MATERIA MEDICA.

BY DANIEL HANBURY, F.L.S.

(*Continued from page* 18.)

The mineral Materia Medica of the Chinese is such as one may expect to find among a people having no scientific acquaintance with chemistry. Numerous substances are employed which are devoid of all active medicinal properties, while others of great power are so administered that the dose must be extremely uncertain. Although most of their mineral drugs are used in the crude state, there are a few, such as the mercurials, which are the results of chemical operations that are evidently conducted with considerable skill.

In the following list I have thought it best to group the substances described under the simple headings of *Calcareous*, *Magnesian*, *Arsenical*, &c., instead of attempting any more scientific arrangement.

SULPHUR.

倭硫黃 *Wei-lew-hwang;* Native Sulphur.—Kæmpfer states that it is found abundantly in Japan.

硫黃 *Lew-hwang;* Sulphur.—Cleyer, *Med. simpl.*, No. 157; *Pun-tsaou*, fig. 85. The specimen has been fused and partially crystallized; it has a greyish-yellow colour.

SILICA.

白石英 *Pĭh-shĭh-ying;* Massive Quartz.—*Pun-tsaou*, fig. 20.

ALKALINE SALTS.

硝 *Seaou;* Nitrate of Potash.—The Chinese distinguish several varieties, as *Pŏ-seaou, Wang-seaou, Ma-ya-seaou*, &c.

鹹 *Kĕĕn;* Native Carbonate of Soda.—Dr. T. Martius has described this substance, a quantity of which was imported into Hamburg in 1845. It is said to be found on the Thibetan frontiers of China.*

硼砂 *Păng-sha;* Borax; Biborate of Soda.—An excellent sample of refined borax: probably imported in a crude state into China from Thibet, where, as is well known, it occurs in certain lakes. Borax is extensively used in China by silversmiths and coppersmiths.

元明粉 *Yuen-ming-fun;* Sulphate of Soda.—It is in crystals, and obtained in all the northern and central provinces of China. M. Rehmann enumerates it in his catalogue of Thibetan medicines.†

磁砂 *Naou-sha;* Chloride of Sodium (a peculiar form).—The specimen which I have received under the above Chinese name is a small rounded fragment of a crystalline substance, of a greyish-green hue, which upon analysis proves to be nothing more than *chloride of sodium* contaminated with a little earthy matter. Such, however, it cannot be regarded by the Chinese, who from some fanciful idea, possibly derived from the locality whence it is obtained, imagine it possessed of great medicinal virtues, and pay for it at the extraordinary rate of 20 dollars (£5) the ounce.

Naou-sha is stated by Keferstein to be a name for carbonate of ammonia and sal-ammoniac, but I have received neither of these substances from China.

CALCAREOUS SUBSTANCES.

寒水石 *Han-shuy-shĭh;* Calcareous Spar (Carbonate of Lime); *Hân xiù xĕ*, Cleyer, *Med. simpl.*, No. 160.—It consists of fragments of colourless crystals.

光粉 *Kwang-fun;* Levigated White Marble (Carbonate of Lime).—This substance is sold in the form of cakes, each weighing from two to three ounces, and enclosed in a little box. It is a remarkably pure form of carbonate of lime, and a very good specimen of careful levigation.

鐘乳石 *Chung-joo-shĭh;* Carbonate of Lime in stalactitic masses.—*Pun-tsaou*, fig. 37. It is obtained from caves. The Chinese name signifies *Hanging-* (like a bell) *milk-stone.*

花蕊石 *Hwa-luy-shĭh;* a granular greenish-white Dolomite (Carbonate of Lime and Magnesia).

玄精石 *Heuen-tsing-shĭh;* Selenite (Sulphate of Lime).—*Pun-tsaou*, fig. 80. Small lenticular crystals (sometimes twin-crystals), translucent, but having a dull exterior. They vary in diameter from $\frac{4}{10}$ to $\frac{2}{10}$ of an inch.

石膏 *Shĭh-kaou;* Fibrous Gypsum (Sulphate of Lime).—*Xĕ cāo*, Cleyer, *Med. simpl.*, No. 166; *Pun-tsaou*, fig. 27.

紫石英 *Tsze-shĭh-ying;* Fluor Spar (Fluoride of Calcium).—*Pun-tsaou*, fig. 21. In fragments of irregular size, and of a purple or greenish colour.

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* *Pharm. Journ. and Trans.*, vol. vi., p. 182.
† *Bulletin de Pharm.*, t. iii., p. 392.

陽起石 *Yang-khe-shĭh;* Asbestous Tremolite; Silicate of Lime and Magnesia. *Pun-tsaou,* fig. 44.—Irregular masses of a pale greenish colour.

MAGNESIAN AND ALUMINOUS SUBSTANCES.

銀精石 *Yin-tsing-shĭh;* Silvery-white Mica.—*Pun-tsaou,* fig. 54. I have also received a transparent green mica under the same name.

金精石 *Kin-tsing-shĭh;* Brown Mica.—*Pun-tsaou,* fig. 54.

青蒙石 *Tsing-mung-shĭh.*—*Pun-tsaou,* fig. 56.

金蒙石 *Kin-mung-shĭh; Cīm mûm xĕ,* Cleyer, *Med. simpl.,* No. 154.

銀蒙石 *Yin-mung-shĭh.*—This substance, and the two preceding, are micaceous earths.

塊活石 *Kwei-hwŏ-shĭh;* Steatite or Soapstone; Silicate of Magnesia. —*Hwă-shĭh, Pun-tsaou,* fig. 31. A friable, greyish-white variety:—the so-called *Soapstone,* from which the Chinese often carve beautiful ornaments, is a silicate of alumina, known to mineralogists as *Agalmatolite.*

紅砂 *Hung-sha.*—This substance is in the form of coarse reddish-brown sand, which, when examined with a lens, is seen to consist of transparent angular fragments, mostly of a pale pinkish hue, mixed with some of a yellowish-brown, or more rarely greenish-black. Sp. gr. 3.848. Professor Guibourt considers it is probably some variety of garnet reduced to powder, and in the absence of positive information I have therefore placed it among the aluminous substances.

飛活石 *Fei-hwŏ-shĭh.*—An argillaceous earth, of a pale yellowish colour, soft to the touch, and formed into little, rectangular, oblong blocks.

赤石脂 *Chĭh-shĭh-che.*—An aluminous earth, of a pale pinkish colour, or white, in soft, friable, irregular masses. It has been examined by Mr Morland, whose analysis shows its composition to be nearly that of Kaolin. The two are as follows:—

	Chĭh-shĭh-che.	*Pure Kaolin.*
Silica	42.93	46.5
Alumina	36.53	39.6
Oxides of Iron and Manganese (mostly Manganese)	4.85	—
Magnesia and Lime	.94	—
Water	14.75	13.9
	100.0	100.0

The *Chĭh-shĭh-che* contains also a trace of fluorine, which was calculated with the oxides of iron and manganese.

白礬 *Pĭh-fan;* Alum.—*Pun-tsaou,* fig. 86.

ARSENICAL SUBSTANCES.

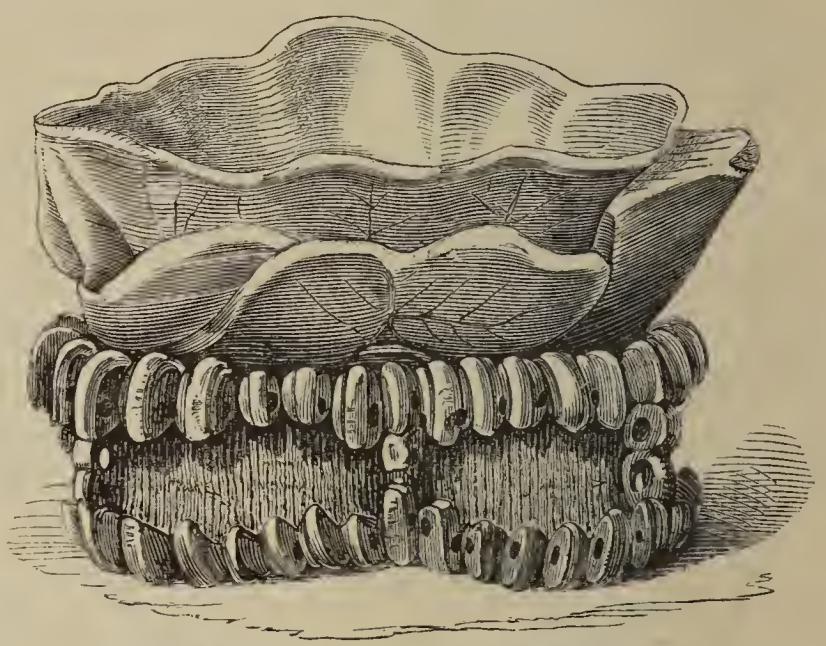
信石 *Sin-shĭh;* Arsenious acid, also called *Pĭh-sin* and *Hung-pe.*—Of the specimens which I have received, some are apparently a natural mineral, constituting a translucent, crystalline mass, varying in colour from pure white to a yellowish-brown or grey. Other specimens have the aspect of the ordinary massive white arsenic of European commerce.

雌黃 *Tsze-hwang;* Yellow Sulphuret of Arsenic; Native Orpiment; *Pun-tsaou,* fig. 26.—It occurs in the province of Yunnan; probably also in Burmah, as it has been shipped in considerable quantity from Moulmein. Ainslie states that it is exported from China to India.*

Orpiment is resorted to by the Chinese in cases of ague, but compounded in a manner so absurd as to render the dose extremely absurd or even a non-entity.

雄黃 *Heung-hwang;* Native Red Sulphuret of Arsenic; Realgar; *Hiûm hoâm*, Cleyer, *Med. simp.*, No. 176.—It is found in the province of Yunnan, in the south of China, and has been exported in small quantity to London from Canton. Realgar is also sometimes imported into England from Bombay.

Small shallow cups, elegantly carved out of this mineral, and often highly polished, are used by the Chinese for administering certain medicines; by which means, when the inner surface of the cup is, as sometimes happens, in a somewhat disintegrated condition, it is evident that a minute dose of arsenic may be administered. One of these cups, with its fanciful wooden stand, is represented in the annexed woodcut. Other carvings, but of a purely ornamental nature, are also manufactured from realgar by the Chinese, and, from their magnificent red colour and fine polish, are often of considerable beauty.



Realgar Medicine-Cup on Carved Wooden Stand.

紅信 *Hung-sin;* Red Sulphuret of Arsenic with Arsenious Acid.—A native mineral, constituting a highly crystalline, striated mass, of a red or pinkish colour, mottled with white,—passing in places into a steel grey. It is composed of Red Sulphuret of Arsenic with a large proportion of Arsenious Acid. The dark parts are probably due to metallic arsenic.

COMPOUNDS OF ZINC, LEAD, AND COPPER.

浮甘石 *Fow-kan-shĭh*, also called *Loo-kan-shĭh;* Zinc Bloom. Dana, *Syst. of Mineralogy*, Ed. 4, vol. ii., p. 460.—An opaque white mineral, easily broken and marking the fingers like chalk. It consists chiefly of fragments of a botryoidal crust, showing, when broken, a glistening, fibrous, radiating structure, sometimes divided into bands or layers slightly stained with oxide of iron. Mr. J. D. Perrins, of Worcester, who has obligingly examined the mineral for me, found its specific gravity (taken with precautions to deprive it of the air in its pores) to be 2.67. Mr. Perrins's analysis gave its composition as follows:—

* *Mat. Med. of Hindoostan*, p. 53.

Oxide of Zinc.....	72.64
Carbonic Acid	14.95
Water	10.63
Carbonate of Lead	1.78
	100.00

From these results, which closely approximate to those obtained by Smithson from the analysis of a similar mineral from Bleiberg, in Carinthia,* the following formula may be deduced:—Zn O, $C O_2$ + 2 (Zn O, HO), with an admixture of Pb O, $C O_2$. Zinc Bloom, according to Dana, occurs with ores of zinc and lead at Bleiberg and Raibel in Carinthia, where it has probably resulted from the decomposition of calamine.

The Chinese mineral is from the southern province of Kwang-si. As found in the native drug-shops, it occurs chiefly in pieces of from one-quarter to one inch in length. Larger pieces, which are perfectly white, are worth 400 *cash* the tael, which equals about one shilling per ounce.

密陀僧 *Meĭh-to-sang;* Litharge (Oxide of Lead).—*Pun-tsaou*, fig. 8; Cleyer, *Med. simpl.*, No. 168.

韋丹 *Wei-tan;* Red Oxide of Lead; Red Lead.

東丹 *Tung-tan;* a dull red powder, consisting chiefly of Red Lead and Carbonate of Lime.

鉛粉 *Yuen-fun;* Carbonate of Lead; White Lead. Prepared at Canton and Soo-chow. A compound plaster, of which carbonate of lead and oil are the chief ingredients, is used by the Chinese.

銅綠 *Tung-lŭh;* Carbonate of Copper (*artificial*).—It occurs in the form of small rectangular cakes of a pale, green colour, opaque and friable.

FERRUGINOUS SUBSTANCES.

鹽生 *Yen-săng;* Magnetic Oxide of Iron.—A coarse, black, sand-like powder, strongly attracted by the magnet.

靈磁石 *Lin-tsze-shĭh;* Magnetic Iron Ore.—*Pun-tsaou*, fig. 45.

自然銅 *Tsze-jen-tung;* Per-oxide of Iron in cubic masses more or less broken.—It appears to have been obtained by calcining iron pyrites. *Pun-tsaou*, fig. 5.

代赭石 *Tae-choo-shĭh;* Red Hæmatite; Per-oxide of Iron. *Pun-tsaou*, fig. 46. It has the form of botryoidal concretions, with a scaly fracture, and ferruginous, metallic appearance.

禹粮石 *Yu-leang-shĭh;* Brown Clay Iron Ore.—Nodular concretions resembling the *Lapis Ætites* of old European Pharmacy, a mineral which, to use the words of Geiger, "*olim dementer ad partum promovendum adhibebatur.*"

無名異 *Woo-ming-e;* Hydrous Peroxide of Iron in rounded grains; Limonite.—*Pun-tsaou*, fig. 34. This substance consists of rounded grains, varying in size between coarse sand and mustard-seeds, with occasional grains still larger. Some of them have a dark, polished surface, and metallic appearance, but the majority are brown in colour, and are more or less dull;

* Chemical Analysis of some Calamines, by James Smithson, Esq., F.R.S.—*Nicholson's Journal*, vol. vi. (1803), p. 74.

when pulverized their colour is ferruginous. They are not attracted by the magnet. An analysis by my friend Mr. J. Morland, Jun., shows them to have the following composition :—

Peroxide of Iron	63.47
Sesquioxide of Manganese	3.55
Silica	15.55
Alumina.....	4.98
Do, with trace of Phosphates.....	1.12
Water.....	11.07
	99.74

Dr. Ure mentions a pisiform variety of Brown Clay Iron Ore in small solid spherical grains, which is used in Dalmatia as shot. The Chinese mineral is found in the provinces of Szechuen and Kwangtung.

蛇含石 *Shay-han-shĭh;* Nodular Iron Pyrites, more or less passed into the condition of per-oxide.

膽礬 *Tan-fan;* Green Sulphate of Iron; Cleyer, *Med. simpl.*, No. 164.

綠礬 *Lŭh-fan;* Green Sulphate of Iron.—*Pun-tsaou,* fig. 87. It is in the state of coarse powder.

MERCURIAL COMPOUNDS.

水銀 *Shŭy-yin;* Mercury.—*Pun-tsaou,* fig. 24.

紅升藥 *Hung-shing-yŏ;* Nitric Oxide of Mercury; Red Precipitate.—A heavy powder, of an orange-red colour, leaving no appreciable residue upon being heated to redness. It contains a little nitrate of mercury, but no arsenic.

輕粉 *King-fun;* Chloride of Mercury; Calomel.—My specimen of the substance called *King-fun*, consists of small, brilliant, colourless, transparent crystals, mostly thin and plate-like, or even pectinated; some are needle-shaped. Chemical examination proves it to consist of two distinct substances, namely, Chloride of Mercury and Sulphate of Lime. The chloride is in a state of great purity and beautifully white. The sulphate of lime is in minute, transparent, acicular crystals, to the naked eye perfectly simulating the chloride of mercury, which it is ingeniously used to adulterate. The proportion in which the two salts exist, is not readily determined, as it is impossible to obtain a uniform mixture for experiment without powdering the entire specimen. From three experiments however, it appears that sulphate of lime constitutes at least a fourth part of the specimen of Chinese Calomel under notice.

King-fun is mentioned by Cleyer as *E kim fuen*, and supposed by him to be a natural production, a suggestion quite inadmissible as regards my specimen. Mr. Lockhart informs me it is brought from the province of Gan-hwuy, but of the locality where it is manufactured, and of the process, I am quite ignorant. The Mongols are said to purchase *Sublimate* of the Russians :*—perhaps by this we may understand *Calomel* also. The Chinese appear to have a correct notion of the use of calomel as a purgative, and they also employ it in the form of ointment in cases of ulcer, to cleanse and produce a free purulent discharge.

硃砂 *Choo-sha;* 丹砂 *Tan-sha;* Cinnabar; Red Sulphuret of Mercury.—*Pun-tsaou,* fig. 23; Cleyer, *Med. simpl.*, No. 177. This mineral has been regarded by the Chinese as the *Philosopher's Stone*, and most extravagant ideas have been entertained respecting it. The Rev. J. Edkins in a communication

* *Bull. de Pharm.*, iii., p. 387.

recently laid before the China Branch of the Royal Asiatic Society* has pointed out that alchemy was pursued in China long previous to its being known in Europe,—in fact, that for two centuries prior to the Christian era, and for four or more subsequent, the transmutation of the base metals into gold, and the composition of an elixir of immortality, were questions ardently studied by the Chinese. It is moreover a matter of history that intercourse between China and Persia was frequent both before and after the Mahommedan conquest of the latter country; that embassies from Persia, as well as from the Arabs, and even from the Greeks in Constantinople, visited the court of the Chinese emperor in Shansi; that Arab traders settled in China, and that there was frequent intercourse by sea, between China and the Persian Gulf; that China had an extensive alchemical literature anterior to the period when alchemy was studied in the West. All these facts go to prove that that pseudo-science originated not with the disciples of Mahommed, but that it was borrowed by them from the Chinese.

With regard to the Philosopher's Stone, it is remarkable that while the alchemists of the West have spoken with doubt as to what it was, with the Chinese its identity appears hardly to have been questioned. That wonderful body which, when used as a chemical agent, was supposed to have the power of converting other metals into gold, and, when employed as a medicine, of conferring immunity from death, is, according to the writings of the Chinese alchemists, *Cinnabar*.

Ko-hung, author of the *Pau p'uh tsi p'ian*, a work of the fourth century of undoubted genuineness, enumerates various mineral and vegetable productions possessing in different degrees the properties of an *Elixir Vitæ*. Of the first of them, Cinnabar, he writes in terms thus translated by Mr. Edkins :—

> When vegetable matter is burnt, it is destroyed, but when the *Tan sha*, [Cinnabar] is subjected to heat, it produces mercury. After passing through other changes, it returns to its original form. It differs widely, therefore, from vegetable substances, and hence it has the power of making men live for ever, and raising them to the rank of the genii. He who knows this doctrine, is he not far above common men? In the world there are few that know it, and many that cavil at it. Many do not even know that mercury comes out of cinnabar. When told, they still refuse to believe it, saying that cinnabar is *red*, and how can it produce a *white* substance? They say also that cinnabar is a stone,—that stones when heated turn to ashes, and how then can anything else be expected of cinnabar? They cannot even reach this simple truth, much less can it be said of them, that they have been instructed in the doctrine of the genii. * * * * * * * * *

The specimens of cinnabar which I have received are in small crystalline fragments and very pure. According to Kæmpfer,† both native and artificial cinnabar are exported from China to Japan, the artificial being used by the Japanese as a colour, and the native been employed in medicine. The same author tells us that in his time, the buying and selling of cinnabar was a monopoly of certain merchants, in virtue of letters patent granted by the emperor.

銀硃 *Yin-choo;* Vermilion; Levigated Red Sulphuret of Mercury.—The process for preparing vermilion is described by an old Chinese author to be as follows:—1 lb. of mercury and 2 lbs. of sulphur are triturated together until they form a blackish powder, which is put into a crucible, closely covered with an iron lid and luted down. The heat of a wood fire is then applied, the lid being kept cool by something wet. The sublimation is thus effected, 1 lb. of mercury usually producing 14 ozs. of cinnabar of the first quality, and 3½ ozs.

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* *Transactions of the China Branch of the Royal Asiatic Society* (Hong Kong), Part 5, 1855, art. iv.

† *Hist. of Japan*, Lond., 1727. Vol. i., p. 113.

of the second. In the Library of the India House (London) is a series of beautiful native drawings representing the preparation of vermilion by the Chinese.

Chinese vermilion is an article of regular importation into London, where the finer qualities realize from 3*s.* 3*d.* to 3*s.* 6*d.* per lb.

黃升藥 *Hwang-shing-yŏ;* Nitrate of Mercury with some Peroxide.—A pale buff powder, wholly volatile.

NOTE ON THE SPONTANEOUS OXIDATION OF OILS, INCLUDING THE CENTESIMAL COMPOSITION OF OXIDIZED AND OF NON-OXIDIZED COD LIVER OIL.

BY J. ATTFIELD,
Demonstrator of Chemistry at St. Bartholomew's Hospital.

Oils are usually arranged under two distinct classes, viz., *volatile*, or essential oils; and non-volatile, or *fixed* oils. The fixed oils are further divided into *non-drying oils*, or those which, in the purified state, remain unaltered when exposed to the air; and *drying oils*, or those which, when laid open to atmospheric influences, gradually solidify to hard, resin-like masses. It is to the latter sub-division that the following remarks refer:—

Saussure was the first who particularly investigated the action of air upon oils. He found that nut-oil, exposed for one year in an atmosphere of oxygen, had absorbed one hundred and fifty times its bulk of that gas, had evolved twenty-two volumes of carbonic acid, and had become almost solid. Sunlight greatly facilitated the reaction. Chevreul, also, who has recently* most minutely examined this subject in connexion with a research upon the siccative properties of the different varieties of common oil-paint, finds that an oil which dries tolerably well in air, dries far more rapidly in oxygen, and not at all in an atmosphere of carbonic acid. Moreover, Chevreul observes that an oil-paint in becoming dry increases in weight from day to day, until ultimately it has absorbed nearly three per cent. of oxygen. The spontaneous combustion of cotton waste, tow, shavings, greasy cloth, or other matter saturated with oil, has long been known to be due to the rapidity with which oil, in such a minutely divided state, combines with oxygen; attention cannot, however, be too frequently drawn to this subject, as heaps of such material are continually allowed to accumulate in rooms where machinery is frequently lubricated, great risk of conflagration being thereby incurred.

The subject of the spontaneous oxidation of oils having been so thoroughly investigated, and so conclusively established, I should not have drawn further attention to the matter had not an experiment presented itself that seemed peculiarly favourable for confirming some of the above results. About ten years ago my friend Mr. Robbins divided a specimen of good cod liver oil into two portions; the one he placed in a well-corked and carefully sealed bottle, the other in a bottle the mouth of which was merely covered over with muslin, and which, therefore, admitted of free action of air upon the oil; both were finally deposited on a shelf open to diffused light, but not to the direct rays of the sun. Now, as cod liver oil belongs to the drying or siccative sub-division of oils, it occurred to me that here was an excellent opportunity of proving, not only that such oils absorb oxygen when exposed to the air, but also the extent to which oxidation takes place under the circumstances narrated. The centesimal composition, also, of a pure oil, and of the same oil after spontaneous oxidation, seemed quite worthy of being placed on record. Mr. Robbins having favoured

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* *Annales de Chimie et de Physique*, Troisième Série, Tome xlvii., pp. 209—283.

me with portions of the specimens referred to, I proceeded to examine them, and the following are the results I have arrived at.

The Pure Oil.—In colour, odour, and taste, it presented all the characteristics of good cod liver oil. 0.2782 grammes of it gave, on combustion with oxide of copper in a stream of oxygen, 0.7855 grammes of carbonic acid, and 0.2825 grammes of water. These numbers lead to the following amounts of carbon, hydrogen, and oxygen in one hundred parts of the oil :—

Carbon	77.00
Hydrogen	11.28
Oxygen	11.72
	100.00

0.3918 grammes of the same oil, after drying over chloride of calcium, gave 1.1126 grammes of carbonic acid, and 0.3974 grammes of water. The percentage composition deduced from these numbers, shows that the oil had lost about four-thousandths of its weight of water, a result that might have been expected from the well-known property possessed by oils of retaining small quantities of that liquid.

Carbon	77.44
Hydrogen	11.27
Oxygen	11.29
	100.00

The Exposed Oil.—By transmitted light it was quite transparent, but by reflected light exhibited a greenish bloom, resembling that of well boiled linseed oil, and was apparently semi-opaque. Its dark red colour contrasted strongly with the pale yellow of the pure oil ; its odour and taste was that of fish in an advanced state of decomposition, and its consistency was such that it could scarcely be made to flow from one vessel to another. 0.2168 grammes of it gave 0.5675 grammes of carbonic acid, and 0.2008 grammes of water. Its centesimal composition is, therefore, thus represented :—

Carbon	71.39
Hydrogen	10.29
Oxygen	18.32
	100.00

0.1991 grammes of the same oil, after drying over chloride of calcium, gave 0.5308 grammes of carbonic acid, and 0.1817 grammes of water. The amounts of the three elements in one hundred parts of this oil, as calculated from the above numbers, shows that in being thus dried it had lost about one and a half per cent. of water. On close examination, however, of the undried specimen of the oxidized oil, I was led to think that the greater part of the water was in the state of mechanical suspension, and this opinion was confirmed when Mr. Robbins told me that on one occasion a small quantity of water had by accident got into the bottle. The following is a statement of the composition of the dried specimen :—

Carbon	72.71
Hydrogen	10.14
Oxygen	17.15
	100.00

Taking now the dried oil as the basis of calculation, it will be seen that cod liver oil, of a given centesimal composition, has, by ten years' exposure to air and

diffused light, lost 4.7 per cent. of carbon, and 0.82 per cent. of hydrogen, and has gained 5.52 per cent. of oxygen. This change may be accounted for as follows:—

First. That one hundred parts of the oil simply have absorbed about five and a half parts by weight—or 51.6 times their volume—of oxygen gas; or,

Second, Bearing in mind that, while some drying oils absorb oxygen but evolve neither carbonic acid nor hydrogen, others absorb oxygen and evolve both carbonic acid and hydrogen, it will be found on calculation that the change may be explained by supposing that one hundred parts of the pure oil have absorbed 18.05 parts by weight—or 143 times their volume—of oxygen, and have generated 17.23 parts by weight—or 95 times their volume—of carbonic acid, and 0.82 parts by weight—or 104 times their volume—of hydrogen.

By either of these theories an oxidized oil would be obtained of the following composition, which, it will be observed, closely corresponds with the numbers already given:—

Carbon	72.68
Hydrogen	10.29
Oxygen	17.03
	100.00

It must be observed, however, that these theories only represent the opposite extremes of a very long series of changes, any one of which may have taken place. For instance, direct absorption of oxygen may have only partially acted in reducing the per-centage of the other elements; evolution of carbonic acid and perhaps of hydrogen accounting for the remainder of the loss. These points can, of course, only be determined by further experiment.

The more important fact, however, that the drying, or rather solidification, of oils is accompanied by absorption of oxygen is, by the above experiments, interestingly confirmed: at the same time extent of oxidation is well indicated.

I have appended the following table in order to show the relative centesimal composition of cod liver and of other oils, as well as the difference, in that respect, between oxidized and non-oxidized cod liver oil:—

	Carbon.	Hydrogen.	Oxygen.	Authority.
Olive Oil	77.21	13.36	9.43	Gay-Lussac and Thénard
Almond Oil	77.40	11.48	10.82	Saussure
Linseed Oil	76.01	11.35	12.64	Saussure
Nut Oil	79.77	10.57	9.12	Saussure
Castor Oil	74.17	11.03	14.78	Saussure
Whale Oil	76.13	12.40	11.50	Berard
Sperm Oil	78.91	10.97	10.12	Ure
Cod Liver Oil	77.44	11.27	11.29	Attfield
Cod Liver Oil (oxidized)	72.71	10.14	17.15	Attfield

Saussure found traces of nitrogen in some of the specimens he examined; that element, however, is only present in oils that have been imperfectly purified.

ON A NEW FORM OF CHLORIDE OF SODIUM.

BY RICHARD V. TUSON,
Lecturer on Chemistry at Charing Cross Hospital.

That chloride of potassium, which ordinarily crystallizes in cubes, is nevertheless often found as an efflorescence on various vegetable extracts assuming the acicular form, is well known. Hitherto, I believe, the corresponding compound, chloride of sodium, has never been observed in needle-shaped crystals, but nearly always in cubes. Occasionally, however, it deposits from urine in octohedra; and when a solution of the salt in water is evaporated at a temperature not exceeding 14° F., it crystallizes in hexagonal tables (Ehrenberg), which

contain, according to Fuchs, six equivalents, but according to Mitscherlich, four equivalents of water of crystallization. At temperatures above 14° F. these hexagonal crystals lose their water of crystallization, and are resolved into a congeries of minute cubes. Chloride of sodium, it is also stated, may be obtained in large oblique rhombic prisms, having the formula Na Cl + 4 Aq. They effloresce in air below 32° F. (Mitscherlich), deliquesce (? effloresce) in air above 32° F. (Fuchs), and leave a powder of small cubes.

Lately, on opening a tightly-fitting tin box in which a quantity of salmon-roe paste had been allowed to remain for nearly three years, it was found that the organic matter was covered by an efflorescence of acicular crystals. One of my pupils collected some of these crystals, analyzed them, and pronounced them to consist entirely of chloride of sodium. As I had never heard of chloride of sodium crystallizing in needles, their examination was repeated, but still the same results were obtained. Some of the crystals were next dissolved in water, and the solution produced submitted to spontaneous evaporation, when the whole of the salt deposited in the ordinary, or cubical form. This result, therefore, fully confirms the conclusions deduced from analysis. The crystals, some of which are nearly half an inch long, appear to be rectangular prisms, terminated by four-sided pyramids. They are beautifully clear, transparent, colourless, elastic, longitudinally and transversely striated, and many are bent or contorted in a manner similar to the native hydrated sulphate of lime, called selenite by mineralogists. The acicular crystals are anhydrous, and undergo no change in form or diminution in transparency when exposed to air at ordinary temperatures, or even at a low red heat. The needles of chloride of sodium possess one property, which is a very familiar characteristic of the cubical salt, namely, that when heated they decrepitate.

It is singular to remark that, at all events, as far as we know at present, the acicular varieties of the chlorides of potassium and of sodium are only developed in the presence of organic matter, just as the production of octohedral chloride of sodium appears to be due to the solution from which it crystallizes, containing urea.

Since writing the foregoing, I have observed an efflorescence of acicular chloride of sodium on an animal deposit which was sent me for analysis, and which had been originally mixed with a solution of common salt to prevent its undergoing putrefaction.

PHARMACY IN PIEDMONT.

BY SUTTON SHARPE.

A TOUR through Piedmont during the memorable days of last year's campaign as a privileged follower in the footsteps of the French army, brought me in contact with our brethren in regions rarely, if ever, trod by the most erratic of our race. The rapid retreat of the Austrians across the Ticino, and the forced marches of the allied army in their pursuit, however, gave me few opportunities to obtain materials, as towns and villages were often passed in the dead of night, and it was only at Alessandria, Novara, and Turbigo, that the bivouac was sufficiently long to allow time for observation. But a still later visit in the less interesting capacity of *commis-voyageur* offered me every facility for examining into the condition and resources of the Piedmontese chemist; a mortal by no means the most enviable in the legion of Galen's disciples. The principle of compulsory examination has long existed throughout Europe, imposed with more or less severity as necessity may suggest, and one marvels that in England contending elements should have so long prevented the adoption of an ordeal amongst the best of the progressive tendencies of the age. The law in Piedmont, however, differs in many respects from that of France and Germany. In Piedmont every large town, Genoa, Nice, Chambery, and others, possess their

laboratory and professors chosen from amongst the most eminent chemists of the place, and forming a local institution holding the same privileges as the supreme school at Turin, with the exception that to commence business in the capital it is necessary to be a licentiate of its school, by far the most esteemed on account of the extended facilities offered to the student. Since the passing of an act in 1853, it is enforced that every one intended for the calling of a chemist must produce a certificate of bachelor from some recognized college, as a guarantee that his private education has not been neglected. An apprenticeship of five years is required, and if three of these be devoted to study and attendance at the laboratory and lectures, the student may present himself for examination; but it more frequently happens that only the last year of apprenticeship is at the student's disposal, after which we find him located for the remaining two years in some garret of unknown altitude in the Via San Carlo, or the miserable streets that surround the Tempio Valdese, the abject type of that race of *étudians* who people the Quartier Latin in Paris—youths with long hair and picturesque threadbare coats, poor, improvident, and ambitious, struggling with every necessitude of fortune, and exposed to vice in its most hideous form. But our poor Sardinian has not the resources of the disciples in Paris, and the ordeal through which he has to pass on the day of examination presses heavily on his mind, for it is only by unwearied application he will be prepared for the presence of that goodly host of *savans* who sit in the Via di Po, for the examinations are prosecuted with much severity. We were present upon one occasion when an unfortunate Genoese came to grief for not knowing that madder contained alizarin and xanthine, and another was plucked for his ignorance of the atomic theory and hydrometrical equivalents. Thinking men have long protested against the pernicious effects produced by examinations so purely theoretical, and which affect the best interests of the future man of business. Dr. Preuss tells us that the dragoons of Frederick the Great were taught trigonometry, but we question if it ever served them on the battle-field, and whether at Molwitz they would have been so disgraced if they had been taught that which is useful before that which is beautiful. The Piedmontese chemist is eminently theoretical, and, at the same time, eminently poor; the atomic theory and hydrometrical equivalents do not aid him in a community of peasants, amongst whom, perhaps, he is destined to live. Science has exalted him above the sordid details of every-day life, and the philosopher's stone is an elusive research which brings no grist to the mill.

The number of pharmacies is limited according to the population; thus we find in a statistical table, in the *Giornale di Farmacia*, of January, 1859, the proportionate number of chemists in the towns and provinces. Turin, with a population of 179,600, has 50 pharmacies, yielding 3592 for each. In Nice there is one for every 2629; in Novara, one for every 1810; while at Cuneo and the villages, where the inhabitants are isolated, the number of inhabitants to each pharmacy sometimes reaches 4000. The restrictive character of this provision, to protect the chemist from a destructive competition, necessarily gives an increased value to houses of reputation in populous towns, and at Turin large sums, exceeding sometimes three or four thousand pounds, are paid for a business and patent. Few young men, however, can be found with capital sufficient for entire purchase, so that a system is general throughout the states, by which the payment is extended over a period varying from ten to twenty years, secured upon the property, which, by the protective law, cannot decrease in value; but this facility of payment has the result of giving a false value to a business, which, after all, yields but a miserable return. The pharmacies are examined annually by government inspectors, who investigate the quality of the drugs employed, and that all poisons and active preparations be kept separately and under lock and key, according to the regulations of the act. But the most

lamentable obstacle against which the man of business has to contend, is the tariff instituted by the Council of Health in 1853, for the regulation of the price of medicines and pharmaceutical preparations, and which produces the most pernicious effects, and paralyses the efforts of those who, by a healthy competition, seek to rival their less intelligent neighbour. This tariff, open to public inspection in every pharmacy, has for its end the prevention of exorbitant prices, by a fixed standard, unaffected by the fluctuations which continually occur in almost every product, and which in reality has the effect of creating imposition rather than subduing it; thus the authorized price of quinine is two shillings and sixpence the scruple, camphor more than a shilling an ounce, which could be sold for half the price, while many products in this anomalous scale are marked much lower than cost price. Leaving Turin, with its neat-looking pharmacies, decorated with mahogany fittings, white marble counters, and graceful urn-like vases, rich but not gaudy, one is surprised at the extreme poverty one encounters at Genoa, the richest city in the state, and of a commercial importance exceeding any other town on the Mediterranean, Marseilles excepted. The best chemists' shops in the place, to which the much-vaunted establishment of Mojon scarcely forms an exception, resemble the *spezierie* in the almost deserted districts of Vicenza and Verona, where one feels oppressed by a sense of poverty or some worse curse, resulting from Austrian domination, which seems to cripple the vitality of every enterprise—*boutiques* that would disgrace the oft-calumniated districts of St. Giles and the Minories. This indigence is accounted for at Genoa by the active competition of several wholesale drug warehouses, who, besides alimenting the provinces with their products in parcels resembling the "foul linen" of some disorderly bachelor tied up by the four corners, retail to the Genoese public *à buon prezzo*, much to the detriment of the legitimate vendors. But it is in the interior where the pitiful condition of our brethren would draw forth sympathy from the most uncharitable, where Romeo would have found a hero at every step "in tatter'd weeds," with overwhelming brows, the type of that fragile wretch at Mantua who sold poison against the law, forced by grievous fortune to confess "my poverty but not my will consents." It is at Tortona, Voghera, Aste, the land of effervescing white wine and shoeless women, Savona, Moriana, Pallanza, where almost every pharmacy tells a tale of woe; its small front filled with miniature squares of glass, painted black, often untouched since its foundation, as if in mourning for a liberal profession fallen low from its high estate, the brick or flagstone floor, ill-shaped bottles filled with mysterious liquids, and labelled with the vilest caligraphy, and about his shelves a beggarly account of empty boxes, green earthen pots, and, lastly, the pale, mysterious-looking proprietor, wearing a low-crowned Turkish-looking hat, eternally smoking in his little back room, often unmoved by the spasmodic ringing and knocking of him who may require his aid, a passive creature of the present, forgetting the future while he indulges in his *dolce far niente*—a curse that enervates the whole Italian family. The resources are limited, medicine is not *à la mode*, life is less artificial in the interior, retaining even primitive simplicity, medicinal plants everywhere flourish, and which instinct or custom has led a great part of the population to employ. The pulp of tamarinds and cassia are the popular remedies—the panacea for all the ills that "flesh is heir to." Their belief in medicine rarely reaches to Epsom salts, while rhubarb and magnesia are looked upon as contemptible drugs; thus in the provinces the pharmacien is reduced to the necessity of retaining for sale a host of articles not less numerous than the miscellaneous horrors of a marine store. Even in Alessandria, a town of fifty thousand inhabitants and a strong garrison, the principal chemist of the place, who resides in the Piazza Largha, would fail to obtain a living were it not for the accessories of an Italian warehouse—tea, coffee, sugar, &c.; and we know a

chemist in a not far distant town who exercises the functions of altisonant town crier, while another is a renovator of faded habiliments. During the short days of last year's invasion the unfortunate chemist was generally the first victim of Austrian exaction; the secret of his varied resources was found out, for his shop contained a little of everything; as the rapacious Yagers expressed themselves, "Diese apothecker haben ein wenig von allem;" and although his shop contained few drugs, which were invariably respected, butter, cheese, and dubious-looking anchovies were in abundance. Well do I remember at the battle of Palestro, in company with a surgeon of the 3rd Zouave Regiment, pushing our way into the village through hundreds of dead and dying in search of a little ammonia to apply to a poor sergeant who had fainted from loss of blood resulting from a flesh wound in the thigh, for the ambulances were still in the rear; the shop was deserted, but we espied the eyes of the proprietor glistening through the gratings of a dark cellar where he had hid himself; there was still desultory firing on the left upon the retreating Austrians, who had evacuated the town, chased at the point of the bayonet by the impetuous Zouaves. Although assured everything was safe, entreaty failed to tempt him from his hiding-place until a Sardinian regiment marched past; he opened his shop, and to our astonishment no ammonia was to be found, its use had not penetrated so far from the capital, but which a collection of Jew's-harps and fishing-rods, loaves of sugar and lamp wicks, seemed to banish every suspicion that it was a pharmacy.

Once more at Genoa, I took the good ship Dante to Nice, where a vast influx of strangers has given an impulse to every branch of industry, and which boasts of three of the handsomest pharmacies in Europe—Pauliau's, Ferrara's, and Mussi's, the latter of which I have the honour to manage.

Nice, June 4th, 1860.

ON THE CULTURE AND COMMERCE OF CHICORY.

BY P. L. SIMMONDS.

The cultivation and use of chicory have now attained a very great importance, not only on the Continent but also in the United Kingdom. Dating its extended use chiefly from the system pursued by the first Napoleon to substitute home-grown for colonial products, it has gradually become approved and popularized for a beverage, either used alone or mixed with coffee, in numerous countries, where it can be sold far under the price of even the lowest-class coffee. The manufacture of a factitious coffee from the roasted root of the *Cichorium Intybus* would seem to have originated in Holland, where it has been used for more than a century. It remained a secret until 1801, when it was introduced into France by M. Orban, of Liège, and M. Giraud, of Homing, a short distance from Valenciennes.

INTRODUCTION AND CULTURE IN ENGLAND.

On the first introduction of chicory into Great Britain a nominal duty of twenty per cent. was levied upon it, which, owing to the representations of the trade, was afterwards increased to the same rate as that then payable on British plantation coffee. The high duty thus placed on foreign-grown chicory soon led to its cultivation at home; but so little was the plant known in England that the farmers required the rent to be paid in advance for the use of their land. In the autumn of 1853 we find it grown in Kent, Surrey, and Essex, where the article was prepared, and met with a great sale. Finding there was an increasing demand for the root, its culture spread to Bedford, Norfolk, Suffolk, Cambridgeshire, Leicestershire, Cheshire, and Yorkshire. The extent of the home production has never been accurately ascertained. In 1850 there were 3000 acres under crop with it within a circuit of ten miles of the city of

York; and in other districts there were 7000 or 8000 more. At first the price realized was as high as £50 per ton ground and £20 per ton in the root. But as the growth extended the price receded. The admission, duty free, of foreign-grown chicory in 1854 led to the abandonment of much of the home culture; and if we are to believe Mr. Gladstone, there are not now 500 acres under culture with chicory in Great Britain.

In 1842 Mr. M'Culloch assumed the growth and consumption of chicory in the United Kingdom to be 6,720,000 lbs., and in a little handbook on "Coffee as it is and as it ought to be," which I published in 1850, I estimated from careful inquiries the consumption of chicory in this country then to have reached more than double that quantity. But Mr. Braithwaite Poole, in his "Statistics of British Commerce," published in 1852, rated the actual production of chicory root made into powder in England and Guernsey, then as high as 14,000 tons, worth, at £22 per ton, £308,000. Besides which, it will be seen the foreign imports average upwards of 5000 tons per annum. The gradual increase of foreign-grown doubtless now replaces much formerly produced at home.

It was not till the trade returns of 1856 that chicory became a distinctively mentioned article in the imports. Since then the imports have been as follows:—

Years.	Quantity. cwts.	Average price.	Value.
1856	81,721	10*s.* 6*d.*	£42,903
1857	93,469	10*s.* 7*d.*	49,461
1858	127,553	9*s.* 6*d.*	61,120

The detailed returns for 1859 are not published yet. The largest quantity received comes from Belgium, the next from Holland, and a little from Hamburg and other quarters.

Mr. George Phillips, when giving evidence before Mr. Scholefield's Committee, in 1855, stated that prior to the year 1832 little was heard of the use of chicory in this country, but in the subsequent three years its use had gradually so increased that the Board of Inland Revenue was obliged to take steps against the sale. "I have no doubt (he adds), from my own experience, that a very large bulk of the public prefer the mixture. That, however, is a question of taste. The trade contend that good coffee, mixed with one-eighth part of chicory and sold at a moderate price, makes a better beverage than ordinary coffee would do at the same price, and the great mass of the public prefer it. Chicory sold as coffee yields a certain profit, but probably it equalizes itself in the general competition of trade. There is a large quantity of chicory sold by itself and drunk as a beverage in the neighbourhood of Manchester and Liverpool. I believe the price of a pound of the cheapest kind of coffee, purchased by the bulk of the poor people, and a pound of the mixture, is about the same. The trade say, where we use a portion of chicory we use a better coffee. I do not know the fact of my own knowledge. Whether the coffee sold in mixtures is of a superior quality to that sold as a pure article would be very difficult to ascertain; it depends upon the question of taste and aroma. The chicory itself is not always pure."

Cultivation.—There are many varieties of the chicory plant, the greater part of which have blue flowers; some are white, and others red. In Brunswick they only grow the broad-leaved or native kind, or the small-leaved which has long roots, and is a native of Magdeburg. The former is, however, preferred, on account of its being the richest. In Altona they grow a medium variety, which has neither very narrow nor very broad leaves. The plant thrives in all soils that will grow carrots; indeed, the mode of cultivating one is much like that of the other. The roots seem to grow best upon a loamy soil, with a clayey subsoil, dry, deep, and rich. It very seldom thrives in heavy clay

land, and never in sand or wet land. It requires much manure. In preparing the land, deep ploughing is recommended; but, unless the soil is very deep, it is probable that subsoil ploughing will answer better. The surface must be well worked; indeed, it cannot be reduced to too fine a mould. As the plants are a long time in coming up, generally five or six weeks from the time of sowing the seed, it is necessary that the land should be very clean, or the weeds (particularly chickweed) are liable to overtop and smother the young plants. The time of sowing varies in different districts; in the midland and eastern counties, the second or third week in May is considered best, for if sown earlier, many of the plants will run to seed; in which case they are called "runners," or "trumpeters," and must be carefully dug out and destroyed when the time for taking up has arrived; because, if allowed to become mixed with the bulk, they will spoil the sample. The best crops have been obtained when the seed has been sown broadcast; but the preference is usually given to drilling, the crop being more easily hoed and cleansed. The rows are generally from nine to twelve inches apart; and about three or four pounds of seed per acre is the quantity used. Most of the cultivators of chicory single out the plants so as to leave spaces between them in the rows, each about six or eight inches long; but there are many who do not do this, fancying that four or five small plants produce more weight of root than one large plant; the expediency of this, however, is very questionable, as it does not allow of the land being nearly so well cleaned as when the practice of singling is adopted.

Harvesting the Crop.—In October or November, the work of taking up the roots may be commenced, and continued during the winter (if the crop cannot be previously secured), until it is finished. Although the roots penetrate a long way downwards, they become too thin below fourteen or fifteen inches to be useful, and the utmost care is also required in order to get up that portion of the root which will prove profitable. In some cases, chicory has been ploughed up, about twelve inches deep, with a strong cast-iron plough drawn by six horses; having men to fork each furrow to pieces, with common potato forks, before a second furrow is ploughed upon it; and women and children following to pick up the roots and cut off the tops. But the best method is found to be that of digging up the roots with double-pronged, strongly made iron forks, the blades being about fourteen inches in length, and each fork, with shaft and handle complete, weighing about eight pounds. The plan of ploughing is liable to bring too much of the subsoil to the surface, and costs quite as much, if not more, than digging. The advantage which is looked for in ploughing is to ensure getting the roots up from a greater depth than can be done by digging, as a great number break off about eight or nine inches long, unless a boy is employed to assist the diggers, and is very careful to pull the top at the precise time that the man presses the root upward with his fork. When dug, the tops should be neatly cut off, and the roots conveyed to the washing-house to be cleaned. Sometimes they are earthed in pits, but, generally speaking, they are taken to the washing-house immediately after being dug up. In the former case, on the Continent, the roots with the leaves cut off are thrown in heaps of from four to six feet in length, width, and height, on the surface of the ground; some straw and then some earth are put around. But generally, the growers deliver the roots to the manufacturers from the latter end of August to November, by whom they are immediately dried. The root is from two to four inches thick, three to seven inches long, and occasionally, in a good soil, three pounds in weight. In Brunswick they obtain from four to six tons of root per Brunswick acre.

The weight of the crop depends entirely upon the richness or poverty of the soil, the tillage and manure it has received, and other circumstances. The

fault in England is the striving to grow as heavy a crop as possible, to the very great detriment of the quality of the root for powder. In Brunswick the price of the root in the original state varies from 20*s.* to 40*s.* per ton, according as the crops have been good or bad, and an acre will realize £5 to £7. The cost for cultivation is from £3 15*s.* to £4 10*s.*; one and a half to two tons is about an average crop. Mr. Wm. Stuckney, who has grown and prepared chicory for the manufacturer to a very great extent on a large farm near Hull, estimates the expense of the cultivation of chicory there at £4 5*s.* 6*d.* per acre, and if we add to this £2 10*s.* for rent, manure, &c., it gives £6 15*s.* 6*d.* The produce on suitable land he states to be from eight to twelve tons per acre, and it requires four tons of green root to make one ton of dried. In the dried state the root is worth from £12 to £24 per ton. Take ten tons per acre, at £2 10*s.* per ton, and this would leave a profit per acre of £18 4*s.* 6*d.* Another competent agricultural authority states that the price of two and a quarter tons of dry root for the acre, at £12 per ton, would be £27; deducting £7 for rent, labour, and other expenses, this would leave a profit of £20 per acre.

Preparation for Market.—The roots are cut into small pieces of about half inch or three-quarter inch lengths by a turnip-cutter, or by hand, the object being to have the pieces of as uniform a size as possible. The slices are then dried in a kiln; this process wasting the chicory from seventy-five to eighty per cent. It is then marketable, and is usually sold to the drysalters and grocers, who roast and grind it as they do coffee. Two pounds of lard or common butter is used with each cwt., to prevent it from burning in the roaster and to impart lustre. The root wastes in roasting twenty-five to thirty per cent. or more. In the ground state it may be kept for years, but it soon cakes. The roasted root is emptied into iron vessels, and, after cooling, is crushed in vertical stone mills, or between iron cylinders. It is then sifted, and during this operation a small quantity of some red colouring substance is added to assimilate it more in appearance to coffee. The product is then weighed off, and sold in packets or canisters.

The root by torrefaction attains a disagreeable bitter, and an aroma something like caramelized sugar. Roasted and reduced to powder, chicory is the most universal substitute for coffee in the chief continental countries, especially in France, Switzerland, Germany, Belgium, Holland, Denmark, Russia, and the other northern States. In Germany the ground chicory is made up into cakes and sold in that form. This root is not superior to many others which possess sweet and mucous principles, but of all the plants which have been proposed as substitutes for coffee, and which when washed and steeped in boiling water yield an infusion resembling the berry, it is the only one which has maintained its ground.

Continental Consumption.—The quantity of the dried root consumed in France is about 16,000,000 pounds a year. Formerly, they were able to export some, but now scarcely enough is produced for home consumption. In 1835, 1,250,000 pounds were exported. In some parts of Germany the women are becoming regular chicory topers, making of it an important part of their daily sustenance. Till within a few years the cultivation was carried on principally near Valenciennes; but lately manufactories have sprung up in several localities, especially at Arras, Cambray, Lille, Paris, Senlis, in Normandy, Brittany, &c. Not satisfied with chicory, the French have recently introduced acorn coffee and roasted beetroot. The beet, it is asserted, besides communicating its hygienic qualities, also helps to sweeten the beverage. The new coffee is called *café de betterave*, as the old was called *café chicorée*. These distinctions will become as puzzling as that in America, which led the Irish waiter to ask if the gentleman would have coffee-tay, or tay-tay.

EXPORTS OF CHICORY FROM BELGIUM.

Years.	Quantity. Kilogrammes.	Value.
1850	670,624	Fr. 134,125
1851	975,162	195,032
1852	1,550,064	310,013
1853	1,310,478	262,096
1854	1,500,022	300,024
1855	2,978,508	595,702

In 1858 the quantity of chicory root imported into Hamburg was 24,592 cwts., and of ground chicory and other coffee substitutes 13,000 cwts.

The chicory entered for home consumption in Denmark and the duchies was, in

1849	lbs. 1,601,032
1850	2,228,295
1851	2,187,985
1852	2,949,553

REPORT OF THE

RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION,

AND OF THE

APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

On the Direct Transformation of Lactic Acid into Propionic Acid. On the Conversion of Tartaric and Malic Acids into Succinic Acid.—A very simple relation exists between propionic acid, lactic acid, and glyceric acid. All three contain the same number of equivalents of carbon and hydrogen, they only differ by equal additions of oxygen, thus :—

Propionic Acid.	Lactic Acid.	Glyceric Acid.
$C_6 H_6 O_4$	$C_6 H_6 O_6$	$C_6 H_6 O_8$

The same kind of relation exists between succinic acid, malic acid, and tartaric acid.

Succinic Acid.	Malic Acid.	Tartaric Acid.
$C_8 H_6 O_8$	$C_8 H_6 O_{10}$	$C_8 H_6 O_{12}$

According to Professor Kolbé's theory these relations are made more apparent, and this chemist has named lactic acid, oxy propionic acid; glyceric acid, dioxy-propionic acid. In like manner malic acid becomes oxysuccinic acid; tartaric acid dioxysuccinic acid. Kolbé regards these acids, in common with a large number of organic compounds, as built upon the type of carbonic acid $2HO, (C_2 O_2) O_2$. By the replacement of the oxygen atoms by hydrogen and allied radicals, the composition of a large number of bodies may be represented, including the alcohols, aldehyds, fatty acids, &c. Thus formic acid is produced by introducing an atom of hydrogen in place of an atom of oxygen ; acetic acid by the introduction of methyl, &c.:—

$2 HO, (C_2 O_2) O_2$ carbonic acid.
$HO, H, (C_2 O_2) O$ formic acid.*
$HO, C_2 H_3, (C_2 O_2) O$ acetic acid.
$HO, C_4 H_5, (C_2 O_2) O$, propionic acid.

By replacing one atom of hydrogen in the ethyl of propionic acid by HO_2, oxypro-

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* When a positive atom replaces the oxygen, Kolbé writes it on the left hand of the Carbonyle $(C_2 O_2)$.

pionic or lactic acid is produced ; by replacing a second atom in the same manner glyceric acid is obtained or dioxypropionic acid:—

$$HO, C_4 \begin{matrix} H_4 \\ HO_2 \end{matrix} (C_2O_2)\ O, \text{ lactic acid (oxypropionic)}$$

$$HO, C_4 \left.\begin{matrix} H_3 \\ HO_2 \\ HO_2 \end{matrix}\right\} (C_2O_2),\ O, \text{ glyceric acid (dioxypropionic)}$$

Kolbé derives the bibasic acids (succinic, malic, and tartaric) from the same type, but doubled: $\left.\begin{matrix} C_2O_2 \\ C_2O_2 \end{matrix}\right\} O_4$

He conceives that succinic acid is constituted by replacing two atoms of oxygen in this type by the diatonic radical $C_4 H_4''$. Then, by substituting HO_2 for an atom of hydrogen in the $C_4 H_4$ he obtains malic acid or oxysuccinic acid ; by replacing a second atom in like manner, tartaric acid or dioxysuccinic acid:—

$$2\ HO, C_4H_4'' (C_2O_2)\ O_2, \text{ succinic acid}$$

$$2\ HO, C_4 \left.\begin{matrix} H_3 \\ HO_2 \end{matrix}\right\} (C_2O_2)\ O_2, \text{ malic acid}$$

$$2\ HO, C_4 \left.\begin{matrix} H_2 \\ HO_2 \\ HO_2 \end{matrix}\right\} (C_2O_2)\ O_2, \text{ tartaric acid}$$

Some time back M. Ulrich, in support of Professor Kolbé's views, discovered a means by which propionic acid could be obtained from lactic acid, and the process by which he effected this result was recommended as an advantageous one to adopt for the preparation of propionic acid. Ulrich's method consisted in distilling dry lactate of lime with pentachloride of phosphorus, by which Wurtz's chloride of lactyle is obtained ; this was then allowed to drop into water containing some finely granulated zinc, when a mixture of propionic and hydrochloric acids was obtained.

M. Lauteman has since effected the same transformation by one simple process of reduction. Hydriodic acid is the agent employed ; iodine is set free, and propionic acid formed. The operation is conducted as follows:—Lactic acid diluted with its own volume of water is saturated with hydriodic acid gas, and the solution heated to 140° C. in a sealed tube ; it acquires an intense colour and deposits iodine. The acid liquid is neutralized with potash, supersaturated with dilute sulphuric acid, and distilled. The distillate is saturated while warm with carbonate of silver, the solution filtered and evaporated in vacuo—propionate of silver remains ($C_6 H_5 Ag O_4$).

The reduction of the lactic acid may be effected more completely and more simply by treating three and a half parts of the acid with a small quantity of water, and four parts of iodide of phosphorus. The reaction is assisted by a gentle heat, and the propionic acid distilled off, coloured with iodine. It is decoloured by sulphuretted hydrogen, and saturated while warm with carbonate of silver. Propionate of silver is deposited on cooling.

The reaction is expressed by the following equation:—

Lactic Acid. Propionic Acid.

$$\overbrace{C_6 H_6 O_6} + 2\ HI = \overbrace{C_6 H_6 O_4} + I_2 + 2\ HO.$$

The very effectual method employed by M. Lauteman for the reduction of oxypropionic, or lactic acid, has been successfully employed by two other chemists for the conversion of malic and tartaric acids into succinic acid. It has been seen that the three latter acids, according to Kolbé's views, present a strict correspondence to propionic acid and its derivatives; and should therefore furnish the same reactions. M. Schmidt made the experiment by dissolving pure malic acid in a saturated solution of hydriodic acid, and heating the solution, in a sealed tube, for eight hours in an oil bath at 130°. The iodine was precipitated, and on cooling, the sides of the tube were covered with crystals of succinic acid, coloured with

iodine. The crystals were purified by recrystallization, and washing with ether. The reaction may be expressed as follows:—

$$\underset{\text{Malic Acid.}}{C_8 H_6 O_{10}} + 2\,HI = 2\,HO + \underset{\text{Succinic Acid.}}{C_8 H_6 O_8} + I_2$$

A precisely similar result was obtained, using tartaric acid instead of malic acid, but with greater difficulty.

M. Dessaignes, independently of M. Schmidt, also succeeded in converting tartaric acid into succinic acid. He introduced some iodine and some phosphorus into a tube, in the proportions to form biniodide, but separated the two substances by an equal weight of powdered tartaric acid. The tube was sealed and heated in a water-bath for several days. The iodine at first disappeared, but was ultimately again precipitated. The contents of the tube, then diluted with water and crystallized, furnished succinic acid.

Action of Iodine on Solution of Cyanide of Potassium.—M. Langlois has shown that when iodine is added to a strong solution of cyanide of potassium, it immediately disappears, and prismatic needle-shaped crystals are at the same time formed, having the composition of iodo-cyanide of potassium. The result is best obtained by employing one part of cyanide of potassium, and two parts of water. The reaction is represented by the following equation:—

$$K\,Cy + 2\,I = KI, CyI$$

These crystals of iodo-cyanide of potassium are very susceptible of decomposition, and they cannot be purified without modifying their composition. The combination between the two iodides appears so weak as to be affected by the slightest causes. Thus water dissolves more of the iodide of potassium than of the iodide of cyanogen; ether, on the contrary, dissolves the iodide of cyanogen, and leaves the iodide of potassium. The crystals, of which the needle-like form is readily perceived under the microscope, even lose iodide of cyanogen by prolonged exposure to the air, and are resolved into cubes. The salt fuses at 90° C., and even at this temperature evolves iodide of cyanogen, but the disengagement is much more abundant between 120° and 130°. If the heat be still greater, the iodide of cyanogen is accompanied by vapours of iodine, and the residue consists of iodide of potassium, and a black substance, having the appearance of paracyanogen, which disappears when further heated in contact with the air.

If the salt be treated with ether, and the resulting solution evaporated spontaneously, fresh crystals are obtained, containing a much larger proportion of iodide of cyanogen, but of which the composition is constant. When heated, they behave precisely as the first compound. Their properties are those of the iodides of cyanogen and potassium.

Analysis gave:—

	I.		II.		Formula KI, 4 CyI, 8 HO.
Iodide of Potassium	18.60	.....	18.91	.....	19.54
Iodide of Cyanogen	72.39	.....	72.76	.....	71.99
Water	9.01	.....	8.33	.....	8.47
	100.00		100.00		100.00

On the Preparation of Phosphorous Acid.—M. H. Schiff has pointed out a method by which this acid may be obtained. When ordinary phosphorus is introduced into a solution of sulphate of copper, brilliant crystals of metallic copper are gradually deposited on its surface, and are ultimately converted into phosphide of copper. If the operation is conducted out of contact of air, and the solution be fed by the further addition of crystals of sulphate of copper, a highly acid liquid is ultimately obtained, containing phosphorous and sulphuric acids. By neutralizing with baryta a portion of the liquid, then adding the remainder, and digesting for a few days, a solution of phosphorous acid free from sulphuric acid is obtained.

Basic Sulphates of Copper.—M. Roucher states that by maintaining sulphate of copper at a dull red heat for several hours it is transformed into an amorphous orange-yellow body, which is a basic sulphate having the composition 2 CuO, SO_3.

This body is not affected by dry air, but it gradually absorbs moisture, assumes a green colour, and is converted into a mixture of neutral sulphate and a compound $3\,CuO, SO_3+2\frac{1}{2}\,HO$. This salt is of a greenish blue colour. He further states that by treating the first compound with water three other salts may be obtained, differing in composition and containing an excess of base.

On the Production of Ammonia from the Nitrogen of the Air.—MM. Marguerite and de Sourdeval point out that by calcining a mixture of baryta and carbon in contact with the air, cyanide of barium is readily formed. This cyanide is decomposed in a current of steam at 300° C., liberating the whole of the nitrogen in the form of ammonia.

ON THE PROXIMATE ANALYSIS OF PLANTS AND VEGETABLE SUBSTANCES.

BY FREDERICK ROCHLEDER, M.D.

(*Continued from page* 28.)

b.—Examination of the watery distillate.

If the watery distillate has a layer of oil on the surface or at the bottom which has been examined in the manner described, this distillate is a concentrated watery solution of the bodies contained in the layer of oil. The method of investigation, when the bodies are known, can be previously determined with exactness. As the bulk of the readily-soluble in water volatile substances must be contained in the distillate, a sufficient quantity of these bodies can be obtained from this watery solution when only a little was present in the separated oil. The *volatile acids* in particular, which almost all are, tolerably soluble in water, can be obtained in large quantity from this fluid; likewise *the volatile bases* when present. To obtain the volatile bases therefrom, the distillate is mixed with a few drops of sulphuric acid, and subjected to distillation. The bases remain as sulphates dissolved in the residue of the distillation. To separate the acids, they must be combined with a base, and the liquid removed by distillation. Although potash or soda, as the strongest bases, have the preference before all other bases, as by boiling they do not permit the volatile acids to become free, with which they have been once combined, their employment is still limited, when besides the volatile acids other volatile substances exist in the distillate which by alkalies undergo a change in the heat if a small excess of such alkalies is present, or when they are rapidly decomposed by the oxygen of the air when in contact with alkalies. If soda or potash is employed, care must therefore be taken that no excess of alkali is present, but rather that a small quantity of free acid remains, which then clearly will not be retained but be distilled off with the water and the other volatile bodies. The potash or soda can be replaced often with advantage, by freshly precipitated carbonate of copper, or the hydrated oxide of copper, by magnesia as well as by white lead, which has been specially prepared by passing carbonic acid through vinegar of lead, and should be applied in a fresh, moist condition, particularly when compound ethers are contained in the solution. When the distillate has deposited no layer of oil, but is clear or only slightly turbid, recourse must be had, as already mentioned, to *cohobation*. But as with cohobation a tedious heating of the fluid with the substance under examination is unavoidable, and the possibility of forming volatile decomposition products is thereby afforded, I prefer the direct concentration of a distillate, which contains few volatile ingredients, to cohobation. The concentration is accomplished in the following manner:—The distillate poor in volatile substances is mixed with so much dry common salt as it will dissolve, and the resulting fluid is subjected to distillation. Generally, after half the water has distilled off, only pure water passes over. The distillation is then interrupted, the distillate is again saturated with common salt, and re-distilled. By the repetition of the distillation as often as it appears requisite, a concentration can be effected which affords a highly concentrated solution of the substances under examination soluble in water, and accomplishes a separation of the greatest part of the substances difficultly soluble in water. If the concentration is not accompanied by the separation of oily bodies by this treatment with common salt, then only bodies are present which are very soluble in water.

To obtain these, two methods are proposed: either the fluid is saturated with common salt and agitated with ether, which, when it separates, is removed and may be evaporated, or the distillate is treated with chloride of calcium. When ethereal oils with high boiling points are present, the treatment with ether is to be preferred. The ether evaporates quickly when exposed in a dish to the air; and to prevent the evaporation of the volatile oil with it, care must be taken that the dish which contains the ethereal solution of the volatile oil is set in a place where a good current of air rapidly conducts away the ethereal vapour. On the contrary, when volatile oils with rather low boiling points are present, the treatment with common salt has the advantage. Into the fluid concentrated by distillation with common salt, chloride of calcium in fragments is thrown in until the fluid appears as thick as syrup; it is then subjected to distillation. The distillate is again treated with chloride of calcium, and re-distilled. By three or four repetitions of these operations either a separation of the dissolved substances ensues (sometimes only a partial one), or the concentration has so far progressed that the substance can be freed from water by the addition of a large quantity of fused chloride of calcium, and distillation, and may be obtained as a distillate, which certainly will be the case when the body possesses a boiling point not above 212° Fahr. It is clear that a concentration of this kind is quite as little necessary as cohobation, when only acid or basic bodies are contained in the distillate.

Before I conclude the examination of the distillate, or rather the volatile bodies present in it, I must here make some observations on the so-called fractional distillation.

Fractional distillation is recommended for the separation of mixed volatile substances. As this operation is generally performed, it is certainly suitable for the preparation in a pure state of the least volatile bodies in a mixture of that kind, but is not adapted for obtaining the more volatile constituents, because at the temperature by which the mixture boils, many of the constituents are evaporated which do not boil at that temperature. The vapours of the boiling constituents do not pass over alone, but also the vapours of the less volatile substances are carried over with them. Instead of heating the mixture to the boiling point, it is more advantageous to heat it near to the boiling point. *A slow evaporation* then takes place, which proceeds, indeed, rather slowly, but by adopting suitable precautions the lighter volatile constituents of a mixture are to be obtained approximately pure, if not absolutely free from all admixture of the other bodies. To guard against the oxidation of substances which so long exposed to the air at elevated temperatures, have opportunities enough to combine with its oxygen, the distillatory apparatus as well as the receiver, should be filled with carbonic acid gas during the evaporation.

While fractional distillation, or an evaporation undertaken at somewhat lower temperatures in a similar manner, is often the only means of separating volatile bodies which are neutral or indifferent, *the method of partial combination is a method of separating volatile bases or volatile acids from one another* when several bases or acids are present at the same time. How the volatile acids are to be separated from other volatile bodies, and likewise the bases from other volatile compounds, has been above set forth.

The method of partial combination was first used by Liebig in separating volatile acids. When we have prepared a fluid which contains the volatile acids separated from the other volatile constituents, and after it has been measured off in a graduated glass, it is divided into ten equal parts, one part of which is accurately saturated with a solution of soda or potash, and after the nine remaining parts have been added, the fluid is distilled. The distillate is thereon divided into nine equal parts, one part saturated with alkali and the other eight parts added, and the whole again subjected to distillation. The distillate is now divided into eight parts, one part neutralized with alkali, the remaining seven parts mixed with this, and the fluid again distilled. In a similar way this proceeding is continued until only a tenth part of the original solution of acids remains in a free condition; consequently in this we have the weakest acid in a condition approximately pure, in the rest of the liquids the potash or soda salts of the other acids, in the first residue of the distillation the strongest acid either pure or contaminated with a little of the next weakest acid, and so forth. It is clear that, in a similar way, many volatile bases

could be separated from one another. The only alteration required in the method given for acids would be that the neutralization of the parts of the fluid must be effected with dilute sulphuric acid or phosphoric acid instead of soda or potash. If in this way we have obtained ten parts of the soda or potash compounds of the acids, or even as many portions of the sulphuric acid or phosphoric acid compounds with the bases, we can procure, by the decomposition of the alkaline compounds with acids, or the salts of the bases with alkalies and distillation, the corresponding acids and bases in a free condition, and then be convinced whether we have had to do with two or more bases or acids. Of course there still remains the determination of the atomic weight and elementary analysis to afford a guide whether the individual acid portions or base portions require or not a further separation by the same method. On this subject I shall speak later in this treatise.

B.—Examination of the aqueous solution.

We turn back to a closer examination of the watery decoction which was obtained by the treatment of the material under investigation with boiling water in the still at the same time with the watery distillate. It has been already mentioned that *by cooling of the hot fluid a separation often* takes place of one or other substance. If such a separation is observed, the separated body is removed by filtration for a closer examination, and it is noticed whether a small portion of the fluid which has been filtered, by further evaporation and cooling throws out more of the bodies which were separated by the cooling of the original decoction. When this is the case, the filtered decoction is concentrated by evaporation, to obtain the principal bulk of such substances difficultly soluble in water. After collecting the substances on a filter, the filtrate is treated as the decoction would have been treated if nothing had separated by cooling.

Frequently the watery decoction contains a proportionately *large quantity of slimy substances*, which belong either to the group of *indifferent carbo-hydrates* or to the class of *pectine compounds*. By the presence of a great quantity of these bodies the watery decoction is often so dense that, when cold, it is quite stringy. These substances, without exception, are insoluble in alcohol. But even when the decoction is not so dense, the precipitates are mostly so voluminous and gelatinous when they are separated, that the fluid cannot be completely filtered from them, but is retained in the voluminous gelatinous flocks. In most cases these substances must be removed. For this purpose the decoction is concentrated by evaporation, and anhydrous alcohol is added to the still hot fluid as long as a bulky flocculent precipitate is thrown down. By filtration the fluid is separated from the precipitate. In many instances alcohol does not produce a bulky flocculent precipitate, but it causes a considerable turbidity, and the precipitate deposits itself as a tenacious mass at the bottom, which is particularly the case when gum or an analogous body is precipitated by alcohol simultaneously with various salts of organic acids.

The spirituous fluid separated from the precipitate is subjected to distillation, which is stopped as soon as all the alcohol has passed over, and thus no longer in the fluid. This watery residue of the distillation is treated precisely as the original watery decoction when no such gelatinous substances, or those rendering the fluid dense and tenacious, were precipitated by alcohol therefrom.

This treatment is as follows:—The watery decoction is divided into several parts. *To one part of the watery decoction is added* a concentrated cold aqueous solution of *acetate of lead*, as long as a precipitate is thereby produced. The precipitate is brought on a filter and washed well with water. The liquid filtered from the precipitate is mixed with vinegar of lead as long as anything is thrown down. This precipitate is likewise collected on a filter and washed with water. The filtrate is freed from the lead contained therein by a stream of sulphuretted hydrogen, separated from the sulphuret of lead by a filter, and the sulphuretted hydrogen expelled by heating the filtrate. The sulphuret of lead is extracted with hot water, and when this takes nothing up it is treated with hot alcohol, and the hot filtered extract is concentrated in a water-bath. Frequently bodies which are retained by the sulphuret of lead crystallize out after long standing from the concentrated aqueous or alcoholic extract. *The fluid precipitated with acetate of lead and vinegar of lead, freed from lead by sulphuretted hydrogen, and filtered from sulphuret of lead*, is, after the expulsion of

the sulphuretted hydrogen, concentrated by evaporation until the residue has a weak syrupy consistence. A small portion of this residue is examined, to learn whether the addition of alcohol precipitates or not substances. If by *the addition of alcohol* at ordinary temperatures, or after heating in a water-bath, a precipitate is developed, the whole residue is treated with alcohol, and the alcoholic liquid filtered from the precipitate. It is then ascertained whether the *alcoholic fluid* filtered from the precipitate when such was obtained gives or not a precipitate on *the addition of ether*. In this case frequently a precipitate results of a semi-fluid character. Sugar, which often exists in parts of plants, is separated by treatment with ether. The precipitate sometimes formed by alcohol is dissolved in the smallest possible quantity of water, and it is observed whether by long standing crystals separate or not. Exactly in the same manner, the precipitate caused by ether is treated. From the fluid containing ether and alcohol by a gentle heat the ether as well as the alcohol is expelled, and the watery residue reserved to observe if crystals form therein or not.

These are the examinations which are performed with a portion of the fluid which has been obtained by the treatment of the watery decoction with sugar of lead, vinegar of lead, and sulphuretted hydrogen.

Another portion of this fluid, after a suitable concentration, is allowed to stand for a long time, to ascertain whether crystals will form or not therein. Frequently *a separation of crystals* takes place in greater or less quantity. If such crystals form, they are separated from the dense mother liquor by a moist linen filter on a glass funnel. The upper part of the filter is closed by means of a thread, and laid between bibulous paper, and pressed upon by a small board with weights, which are gradually increased to increase the pressure. *In the mother liquor separated from the crystals*, besides other bodies, is always deposited a greater or less quantity of the crystalline substance, according to its degree of solubility, which, upon a closer examination of the mother liquor, must be taken into account. This closer examination will be spoken of further on.

A second portion of the watery decoction is treated with *animal charcoal*. A glass tube, about half an inch broad and eight or ten inches long, is taken, which should be drawn to a point at one end. The mouth of the point must be about the size of a hempseed. Into the wide end of the tube a piece of loose cotton wool is introduced and pushed into the pointed end of the tube, which is fastened vertically in a clamp, with the narrow mouth downwards. The tube is filled six or seven inches high with pure animal charcoal, and the watery decoction is poured in by the aid of a small funnel inserted in the upper mouth of the tube. The fluid, as it passes through the tube into a glass flask, is replaced in the same manner by a fresh portion. *Colouring and bitter principles* are taken up frequently by the animal charcoal from the watery decoction, so that the colour and the taste of the escaping fluid are often very different from the colour and the taste of the original liquid. When the quantity of fluid set apart for this experiment has run through the charcoal, and this fluid has been removed, the charcoal is washed with cold water, to completely separate the bodies which are not retained by the charcoal. The charcoal is transferred to a vessel suitable for boiling, and boiled with *strong alcohol*. The spirit is filtered hot from the charcoal by means of a hot-water funnel, and the decoction with alcohol repeated as long as this takes up anything. The spirituous solutions are concentrated by distilling off the greatest part of the alcohol, and the concentrated extract (the residue of the distillation) is allowed to stand, to ascertain whether crystals form or not therein. Should crystals not separate by long standing, the residue is dissolved in water and further examined. On the contrary, should crystals form, they are first separated from the mother liquor, and these, as well as the mother liquor, subjected to a closer examination. *The liquid treated with animal charcoal* is treated precisely as the first portion of the watery decoction.

A third portion of the watery decoction is mixed with *a solution of alum*, and then *ammonia* is added to the fluid. If a *precipitate* results thereby, the alumina exists therein, partly as a hydrate, partly combined with one or more organic substances. The precipitate is removed by filtration, and washed on the filter with water. To the *filtrate* so much dilute sulphuric acid is added as will almost neutralize the whole

quantity of free ammonia which has been added in excess. The residue of ammonia is saturated with a few drops of acetic acid, the neutralized fluid is evaporated to a small volume, and the residue mixed with anhydrous alcohol. This precipitates a considerable quantity of sulphates of potash and ammonia, which should be removed from the alcoholic solution by filtration. From this solution the alcohol is distilled off, and the syrup residue again treated with anhydrous alcohol, which separates the rest of the sulphates sometimes mixed with more or less organic matter insoluble in alcohol. This alcoholic solution is likewise freed from the greatest part of its alcohol by distillation and the residue set aside, by which crystals are frequently separated; the crystals and the mother liquor are separated, and submitted to a closer investigation. When no crystals are formed, the whole residue is subjected to investigation.

We return now to both *the precipitates* which were produced by *sugar of lead and vinegar of lead in the first part of the aqueous decoction.* As before remarked, the second part of the watery decoction, after treatment with animal charcoal, is precipitated with sugar of lead and vinegar of lead exactly in the same way as the first part of the watery decoction not treated with animal charcoal. If the animal charcoal has not taken up and retained any substances from the watery solution, it is self-evident that the precipitates obtained by sugar of lead and vinegar of lead in the portion of the watery decoction treated with animal charcoal have quite the same composition as the corresponding precipitates from the first part of the decoction which was not treated with animal charcoal. In this case, the corresponding precipitates can be united with one another, and, as a whole, be employed for examination, which must not be the case when the animal charcoal has separated any substances. In the latter instance the precipitates are separately examined with regard to their composition, and in the same way.

The precipitate produced by sugar of lead is extracted with alcohol when a small portion has shown that it is partially soluble in alcohol. If the alcohol dissolves nothing, a small portion is tried with spirit of specific gravity .825, to ascertain whether that effects a partial solution. If the *alcohol or spirit* has partially dissolved the precipitate, the *insoluble* is separated from the *dissolved part* by a filter. The lead compounds of sulphuric and phosphoric acids, as well as those of oxalic acid and many other organic acids frequently present, do not dissolve in alcohol or spirit. On the contrary, there is a great number of substances which form compounds with lead insoluble in water, but soluble in alcohol and weaker spirit. The *alcoholic* solution is decomposed by a stream of sulphuretted hydrogen, and then filtered; the sulphuret of lead is washed on the filter with anhydrous alcohol as long as anything is taken up, afterwards the sulphuret of lead is treated with water on the filter, as it often happens that a substance quite or almost insoluble in anhydrous spirit is contained in the sulphuret of lead which dissolves in water, and can be thus extracted. By evaporation, the filtrate spirituous as well as aqueous is reduced to a small volume, and this residue set aside to afford an opportunity for crystals to form, which sometimes happens when crystallizable substances are present.

The part of the precipitate thrown down by sugar of lead from the watery decoction, and insoluble in alcohol or spirit, is, after having been washed with alcohol or weaker spirit, formed into a thick smooth paste, and a small portion of this paste is mixed with a great excess of *acetic acid.* It is observed whether the whole or a part of the precipitate appears. Sometimes very little or nothing dissolves in the acetic acid. When a partial or complete solution is noticed, the whole quantity of the precipitate, mixed with the water, is treated with acetic acid as long as a decrease of the precipitate results. Now, either a complete solution is obtained, or in the resulting solution an insoluble portion is suspended. In the latter case the solution is filtered from the undissolved portion. Either this filtered solution, or the entire liquid when all the precipitate dissolves in the acetic acid, is mixed with vinegar of lead in a very concentrated condition. With continued agitation small quantities of the vinegar of lead are added. It often happens that a precipitate forms after a very small quantity of the vinegar of lead has been added, although the fluid is still strongly acid. After this precipitate has been removed by a filter, much vinegar of lead can be added before a fresh precipitate forms, which first appears when the free acetic acid has been neutralized by the vinegar of lead. If a second

precipitate ensues by the addition of much vinegar of lead, this is collected on a filter by itself. Both precipitates which are thrown down from the acetic acid solution, or the precipitate when only one results, must be purified by washing with water on the filter, then distributed in water to be decomposed with sulphuretted hydrogen. The fluid is separated from the sulphuret of lead by filtration, and the excess of sulphuretted hydrogen expelled. This expulsion is most conveniently effected in a glass flask, or in a tubulated retort, in a water or chloride of calcium bath. Carbonic acid gas should be driven through the fluid to displace the air in the retort or flask, and prevent the decomposition of the sulphuretted hydrogen accompanied by the separation of sulphur. Heat must not be applied to the apparatus until all the air is displaced by carbonic acid gas. *The precipitate* which is produced by *vinegar of lead* in the fluid which was filtered from the precipitate which sugar of lead occasioned in the *watery decoction*, is likewise examined with reference to its solubility in alcohol and in weaker spirit, wherein it may be partially or quite soluble, or quite insoluble. *The precipitates soluble in alcohol or spirit, and those insoluble therein*, are treated in precisely the same manner as directed for the precipitates derived by sugar of lead from the watery decoction. The precipitate resulting from sugar of lead is manifestly always completely soluble in acetic acid. In many cases, indeed, a number of substances are entirely thrown down from the watery decoction by sugar of lead, so that the precipitates formed by vinegar of lead contain none of the substances which are contained in the precipitates produced by sugar of lead. But these favourable instances of complete separation are only exceptions to the rule. Mostly the precipitate obtained by vinegar of lead contains substances which were contained in the first precipitate—namely, in that part of the first precipitate by sugar of lead which dissolved in acetic acid, and was again thrown down by vinegar of lead from this acid solution.

It is here particularly necessary to draw attention to a circumstance, namely, to *the presence of bodies in the precipitates produced by vinegar of lead*, which are not contained *in these precipitates* in the form of lead compounds, but are in *a free condition*. Let it be assumed that the watery decoction contains an organic base very difficultly soluble in water in the form of a salt soluble in water, whose acid produces with oxide of lead a compound insoluble in water, it will be evident that the acid of this salt will be contained in the precipitate resulting from sugar of lead, and the base of this salt will be found as an acetate in the filtered watery solution. If this fluid is neutralized with vinegar of lead, a weak base can be thereby separated from the acetic acid, and is precipitated in water on account of its insolubility in conjunction with the different lead compounds formed. Bodies admixed with precipitates of that kind which are produced by vinegar of lead, generally dissolve in alcohol, especially when heated. They are in this way often easily obtained pure when the lead compounds in these precipitates are insoluble in alcohol, or possess a very slight solubility in that menstruum. What has been stated explains the peculiarity sometimes existing of a precipitate resulting from vinegar of lead dissolving partially in alcohol or spirit, without more than a trace of lead being detectable in the solution.

When two precipitates have been developed by sugar of lead and vinegar of lead, and these are separated into two portions by treatment with alcohol or spirit, which decomposes the portion of the precipitate resulting from sugar of lead, and insoluble in alcohol, into one part soluble in acetic acid containing water, and into another part insoluble therein, and these parts freed from lead by sulphuretted hydrogen, these substances thus freed from lead, as well as the different portions of sulphuret of lead, must be further examined.

For this purpose, the *various portions of the sulphuret of lead* are treated immediately, after being washed, first with *boiling water* and then with *boiling spirit*, to ascertain whether these fluids extract anything from the sulphuret of lead. After the sulphuret of lead has been exhausted with water and spirit, it is exhausted with *dilute aqueous ammonia*, and the filtered ammoniacal solution is completely neutralized with acetic acid. The oxidation products of tannin and analogous coloured substances are often in this way extracted by the water containing ammonia from the sulphuret of lead, and precipitated from their solutions by acetic acid.

It is self-evident that *the different portions of the substances free from lead* which are obtained from the parts soluble and insoluble in alcohol and spirit, of the

precipitates developed by sugar of lead and vinegar of lead from the portions soluble and insoluble in acetic acid, of the parts insoluble in alcohol and spirit of the precipitates thrown down by sugar of lead, may still be a mixture of several bodies. To ascertain this, the individual parts, separated according to the directions above given, are further investigated by *fractional precipitation* with regard to their homogeneousness. It is scarcely necessary to mention that bodies which have been separated in a crystalline form by the standing of the fluids, properly evaporated in the air or in an exsiccator, must be previously removed from the mother liquors, and that in such cases the diluted mother liquors must be submitted to examination by fractional precipitation.

For *fractional precipitation*, the two lead salts, *sugar of lead* and *vinegar of lead*, are employed, which served for separating up to a certain point, as previously described. The fluids which afford no precipitate with sugar of lead are heated with vinegar of lead. *Fractional precipitation* is conducted in the following way:—The whole quantity of the fluid to be examined is measured in a graduated glass to estimate its volume, and then it is ascertained how much of a certain solution of sugar of lead or vinegar of lead is required by volume to completely precipitate the fluid. With this object, a small portion of the fluid to be examined is taken before it is measured off, and exactly neutralized with ammonia. If the quantity of solution of sugar of lead or of vinegar of lead is known which is required to precipitate the whole quantity of the fluid, the whole quantity, after exact neutralization with ammonia, is mixed with a tenth part of the quantity of solution of sugar of lead or vinegar of lead which was required for its entire precipitation. The precipitate is filtered off, and the second tenth of the solution of sugar of lead or vinegar of lead is added to the filtrate, whereon the precipitate is again collected on a filter. This process is continued until ten precipitates are obtained from the fluid, all of which are washed with water, diffused in the same medium, and decomposed with sulphuretted hydrogen, whereby ten parts result from a fluid, which are subjected to a more minute examination when the sulphuretted hydrogen has been driven off.

I have convinced myself that this fractional precipitation is not so suitable to effect the separation of various substances as another method, which I will call *fractional solution*. This is executed thus:—It is determined how much acetic acid is required to dissolve the whole quantity of a precipitate which has been diffused through water to a smooth paste. Now, if a tenth part of the acetic acid is added, a tenth part of the precipitate is dissolved. This solution is filtered off, the precipitate found on the filter is transferred to a beaker glass by means of a stream from a washing bottle, and then treated with the second tenth of the acetic acid, &c. The ten solutions are precipitated with vinegar of lead, the ten precipitates collected, each washed on a filter with water, diffused in water, and decomposed with sulphuretted hydrogen. The sulphuret of lead is separated by a filter, the excess of sulphuretted hydrogen expelled, and each of the ten fluids tested with reagents. It is evident that only lead compounds soluble in acetic acid can be in this manner treated, and not the parts of precipitates insoluble in that menstruum which are produced by sugar of lead in the watery decoctions, and remain undissolved by treatment with alcohol.

(*To be continued.*)

ETHER AS A REMEDY FOR DEAFNESS.

The attention of the public, both medical and non-medical, has been of late attracted by a fact which, though in its origin and early phases going back some years, is of interest through the publicity given to it by the official journal of the University of Paris, as well as through the daily press.

To state the question briefly:—About the month of August, 1855, a certain Mademoiselle Cléret, a private governess, inhabiting a populous part of Paris, applied to the Minister of Public Instruction for assistance, basing her application, among other grounds, upon her knowledge of a method of causing the deaf and dumb to hear. This method, the discovery of which was accidental, and of which she had made a successful trial upon some pupils suffering from deafness, after having experienced its efficacy in her own person, consists in the use of sulphuric ether dropped direct into the external auditory canal at the rate of four, five, six, or eight

drops per day. After the application of the remedy for fifteen or twenty days, its use may be suspended some days, and then renewed; it may be continued, if not indefinitely, at least for a very lengthened period.

A commission appointed by the Minister, and of which the medical element included M. Lélut as president, M. Béhier as secretary, and the late M. Bérard, was deputed to examine into the state of the children submitted to it by Mademoiselle Cléret. The commission pursued its investigation with the utmost diligence, until upon a sudden the lady was seized with a fearful malady. After having waited, without much hope, an improvement in the mental condition of Mademoiselle Cléret, the commission drew up its report, although the question, necessarily suspended, did not appear susceptible of being brought to a definite conclusion, or to a complete and demonstrative result. It considered, however, that it was its duty to make known such facts as it had witnessed: this it did in the following terms:—

Twenty-nine children have been treated by this lady; all with beneficial results. Two of those brought by her before the commission, and who had been treated by her previously, were completely cured. Seven children have been submitted to the commission previous to any trials being made upon them, and their absolute deafness and dumbness demonstrated by Mademoiselle Cléret; and in all cases, but especially in four, a manifest change has been perceptible after eight or nine months of treatment, and the patients have been able to recognise with great ease various sounds. The reporter to the commission has been careful to add that the most minute precautions were taken to avoid sources of error, and to guard against any illusion that might arise from perception derived through another sense than that of hearing.

The commission, wishing to test the means used by Mademoiselle Cléret upon other cases than those exclusively under her own care, deputed one of their number to carry out her plan of treatment upon other patients. Twenty persons were accordingly entrusted to him; most of them were deaf-mute children, but there were also some old men whose hearing was impaired—in some cases upon one side only. In all these a very noticeable effect was produced. It was also found that patients whose sense of hearing had become impaired through typhoid fever were very speedily restored by the same treatment.

In conclusion, the commission state that with the exception of two or three children whose deafness and dumbness was attested by authentic certificates, and who now hear well, it has determined nothing but the incomplete results of experiments commenced, but not terminated, manifest improvement, but nothing more definite.—*Gazette des Hôpitaux*, 8th May, 1860.

ON ACIDS AND SALTS.

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(Abstract of a Lecture delivered at the Royal Institution.)

It is natural to inquire whether the doctrines of series and substitutions, which are essential for the association of organic products, may not throw some additional light upon the simpler compounds of mineral chemistry, when viewed as unitary molecules; and particularly upon the relations and properties of the mineral acids and their salts, which have hitherto constituted the strongholds of the electro-chemical, or binary theory of combination.

The doctrine of series affirms that chemical compounds may be arranged in series, the successive members of each of which differ from one another in composition by a common increment, and are associated with one another by a certain relation of properties, the exact nature of the relation varying with the nature of the increment.

The doctrine of substitutions affirms that, in very many chemical compounds, one or more atoms may be displaced by some other atoms or groupings, and that the new bodies, resulting from this displacement, correspond in constitution with the normal bodies from which they were derived. The doctrine of substitutions affords great assistance to the doctrine of series; for when, as frequently happens, a gap exists in any series, that gap can almost always be filled up by a substitution-representative of the missing body.

(α.) There are four acid compounds of hydrogen, two volumes of each of which contain one volume of hydrogen, namely:

HF	Fluorhydric acid
HCl	Chlorhydric acid
HBr	Bromhydric acid
HI	Iodhydric acid

When two volumes of chlorhydric acid, for instance, are acted upon by a red-hot iron-wire, the chlorine is absorbed by the iron, and one volume of hydrogen gas liberated. The two volumes of chlorhydric acid yield one volume of hydrogen, or the original bulk of gas is reduced to one-half by the absorption of its chlorine. The above four acids may be looked upon as substitution-representatives, one of another.

Chlorhydric acid yields the following series of oxides, convertible into each other by mutual metamorphosis:

HCl	Chlorhydric acid
HClO	Hypochlorous acid
$HClO_2$	Chlorous acid
$HClO_3$	Chloric acid
$HClO_4$	Perchloric acid

When chlorhydric acid HCl, is oxidated by permanganic acid, hypochlorous acid HClO, is produced; and, conversely, chlorhydric acid may be reproduced by the deoxidation of hypochlorous acid. Hypochlorous acid, when heated, breaks up into chloric acid $HClO_3$, and other products. When chloric acid is deoxidated by nitrous acid, it becomes chlorous acid $HClO_2$; and, when oxidated at the positive pole of a galvanic battery, it becomes perchloric acid $HClO_4$. Here then is a series of associated acids, expressed as unitary molecules, by the simplest possible formulæ, and arranged in a series, the successive members of which differ from one another in composition by an increment of one atom, or volume, of oxygen.

(β.) There are four other binary compounds of hydrogen, two volumes of each of which, however, contain two volumes of hydrogen, namely:

H_2O	Water
H_2S	Sulphydric acid
H_2Se	Selenhydric acid
H_2T	Tellurhydric acid

A given volume of any one of these gases or vapours contains exactly twice the quantity of hydrogen that the same volume of any one of the first class of gases contains. When two volumes of sulphydric acid, for instance, are acted upon by a red-hot iron-wire, the sulphur is absorbed by the iron, and two volumes of hydrogen gas are liberated. The two volumes of sulphydric acid yield two volumes of hydrogen or the abstraction of the sulphur produces no alteration in the bulk of gas. The bihydric character of water, moreover, is well shown by the experiment of its electrolytic decomposition, in which two volumes of hydrogen are produced for every one volume of oxygen.

In the sulphur series of oxygen acids we have two gaps, which, however, can be filled up by the chloro-representatives of the missing bodies, thus:

H_2S	Sulphydric acid	Cl_2S
H_2SO	Wanting	Cl_2SO
H_2SO_2	Wanting	Cl_2SO_2
H_2SO_3	Sulphurous acid	
H_2SO_4	Sulphuric acid	

The compounds Cl_2SO, and Cl_2SO_2, are obtainable from the chloro-representative of sulphydric acid Cl_2S, by successive oxidation. The first product actually afforded by the oxidation of sulphydric acid is sulphurous acid H_2SO_3, which is produced by the combustion of sulphydric acid in air or oxygen. Conversely, sulphydric acid may be obtained by deoxidating sulphurous acid with nascent hydrogen. Sulphuric acid H_2SO_4, results from the oxidation of sulphurous acid, and by deoxidation can reproduce that body, as in the ordinary process for the preparation of sulphurous

acid. Here, then, including the chloro-representatives, is a second series of acids associated with one another by a common increment of composition, and by mutual metamorphosis.

Sulphuric acid H_2SO_4, is the representative on the sulphur series, of perchloric acid $HClO_4$, on the chlorine series. Each contains one atom of the radicle which gives the special character to the acid, in the one case chlorine, in the other sulphur. Each contains also four atoms, or volumes, of oxygen; but whereas perchloric acid contains only one atom, or volume, of hydrogen, sulphuric acid contains two atoms, or two volumes. And this difference in composition leads to a marked difference in the properties of the two acids. Perchloric acid $HClO_4$, has only one atom of hydrogen that can be replaced. Hence it forms only one description of salt, such, for instance, as perchlorate of potassium $KClO_4$, and only one description of ether, such, for instance, as perchloric ether $EtClO_4$. But sulphuric acid has two hydrogen atoms that can be replaced. Hence it can form acid salts, neutral salts, double salts, acid ethers, neutral ethers, double ethers, and saline ethers, as shown in the table.

H_2SO_4	Sulphuric acid
$KH\ SO_4$	Acid sulphate of potassium
K_2SO_4	Neutral sulphate of potassium
$KNi\ SO_4$	Potassio-sulphate of nickel
$EtH\ SO_4$	Ethylo-sulphuric acid
Et_2SO_4	Neutral sulphate of ethyl
$EtMe\ SO_4$	Ethylo-sulphate of methyl
$EtK\ SO_4$	Ethylo-sulphate of potassium

This property of forming acid and double salts, and acid and double ethers, &c., indicates a fundamental difference in character between sulphuric and perchloric acids, a difference that is satisfactorily represented by the difference in their formulæ as here written down, $HClO_4$, and H_2SO_4. Bibasic characters are manifested as decidedly by the sulphurous and sulphydric acids.

(γ.) There are four other binary compounds of hydrogen, two volumes of each of which, however, contain three volumes of hydrogen, namely:

H_3N	Ammonia
H_3P	Phosphamine
H_3As	Arsenamine
H_3Sb	Stibamine

When the two volumes of phosphamine, for instance, are acted upon by a red-hot iron-wire, the phosphorus is absorbed by the iron, and three volumes of hydrogen gas are liberated. Two volumes of chlorhydric acid yield one volume of hydrogen; two volumes of sulphydric acid yield two volumes of hydrogen, while two volumes of phosphamine yield three volumes of hydrogen; and this is a most important distinction between the three classes of hydrides to which these three gases respectively belong. Again, two volumes of gaseous ammonia, when decomposed by the Ruhmkorff spark, become converted into three volumes of hydrogen and one volume of nitrogen; or the original bulk of the ammonia becomes doubled.

In the phosphorus series of oxygen acids there is but one gap, and this can be filled up by the chlorine- or the ethyl- representative of the missing body.

H_3P	Phosphamine	Cl_3P	Et_3P
H_3PO	Wanting	Cl_3PO	Et_3PO
H_3PO_2	Hypophosphorous acid		
H_3PO_3	Phosphorous acid		
H_3PO_4	Phosphoric acid		

Brodie has ascertained that oxichloride of phosphorus Cl_3PO, may be obtained directly by passing oxygen gas through boiling terchloride of phosphorus, or trichlorophosphamine Cl_3P. The union of tri-ethyl phosphine Et_3P, with oxygen, to form the oxide of tri-ethylphosphine Et_3PO, constituted one of Hofmann's earliest experiments on the phosphorus bases. Proceeding to the actual oxides of phosphamine, it is doubtful whether hypophosphorous acid H_3PO_2, has been obtained by the oxidation of phosphamine; but, on the other hand, phosphamine is readily obtainable by deoxidating hypophosphorous acid with nascent hydrogen; while by oxidating hypo-

phosphorous acid, phosphorous and phosphoric acids are successively produced. Phosphorous acid H_3PO_3, results from the slow oxidation, and phosphoric acid H_3PO_4, from the rapid oxidation of phosphamine. Conversely, phosphamine may be obtained by the deoxidation of each of the two last-mentioned acids. Here again then is a series of naturally associated and mutually convertible bodies, represented by the simplest possible formulæ, by formulæ which do not express any speculative view whatever, but merely indicate the indisputable fact that these bodies, or their representatives, differ from one another in composition, by the successive increments of one, two, three, and four oxygen atoms.

Phosphoric acid H_3PO_4, is the representative on the phosphorus series, of sulphuric acid H_2SO_4, on the sulphur series, and of perchloric acid $HClO_4$, on the chlorine series; but whereas perchloric acid contains only one atom of hydrogen, and can form only one class of salts and ethers; whereas sulphuric acid contains only two atoms of hydrogen, and can form only two classes of salts and ethers; phosphoric acid contains three atoms of hydrogen, and can form three classes of salts and ethers. One-third, two-thirds, or three-thirds of its hydrogen may be displaced by a metal or basic radical, or the hydrogen may be partly or wholly displaced by two or three different metals, or by two or three different radicals, or by a mixture of metals and radicals, thus: $EtKCuPO_4$, or $H(NH_4)NaPO_4$, &c.

(δ.) There is yet another primary hydride to be considered, namely, that of silicon, the siliciuretted hydrogen of Wöhler. The composition of this body has not been ascertained. It has been ascertained, however, that the substance from which it is obtained by the action of chlorhydric acid, is a silicide of magnesium, represented by the formula Mg_4Si, whence the formula of siliciuretted hydrogen is assumed to be H_4Si, analogous to that of marsh gas H_4C, a conclusion strongly confirmed by the composition of chloride of silicon, which is undoubtedly Cl_4Si, that is, a chloro-representative of siliciuretted hydrogen. Each primary hydride, hitherto considered, has yielded a remarkably stable acid, formed by the addition of four atoms of oxygen to the hydride; and hydride of silicon ought to behave in the same manner, thus:

Chlorhydric acid	HCl	$HClO_4$	Perchloric acid
Sulphydric acid	H_2S	H_2SO_4	Sulphuric acid
Phosphamine	H_3P	H_3PO_4	Phosphoric acid
Hydride of Silicon	H_4Si	H_4SiO_4	Silicic acid

Now whether or not H_4SiO_4, is the correct formula for silicic acid, it is certain that the great majority of simple and well-defined silicates may be referred to that type, as illustrated in the table.

ORTHOSILICATES.

Et_4SiO_4	Silicic ether	Gl_4SiO_4	Phenakite
Li_4SiO_4	Silicate of lithium	Ce_4SiO_4	Cerite
$Na_2H_2SiO_4$	Silicate of sodium	Fe_4SiO_4	Fayelite
Ca_4SiO_4	Silicate of calcium	$Fe_2Mn_2SiO_4$	Knebelite
Mg_4SiO_4	Olivine, Chrysolite	$Cu_2H_2SiO_4$	Dioptase
$Ca_2Mg_2SiO_4$	Batrachite	$Al_2Ca_2SiO_4$	Anorthite
Zn_4SiO_4	Zinc glance	$Al_2Mn_2SiO_4$	Karpholite

This next table illustrates the general relations of the perchloric salts and ethers, to their sulphuric, phosphoric, and silicic analogues. The existence of the silicated compounds corresponding to the formulæ in italics, has not yet been established.

ACIDS, SALTS, AND ETHERS.

HCl	$HClO_4$	$NaClO_4$		
		$EtClO_4$		
H_2S	H_2SO_4	Na_2SO_4	$NaHSO_4$	
		Et_2SO_4	$EtHSO_4$	
H_3P	H_3PO_4	Na_3PO_4	Na_2HPO_4	NaH_2PO_4
		Et_3PO_4	Et_2HPO_4	EtH_2PO_4
H_4Si	H_4SiO_4	Na_4SiO_4	*Na_3HSiO_4*	$Na_2H_2SiO_4$ | NaH_3SiO_4
		Et_4SiO_4	*Et_2HSiO_4*	*$Et_2H_2SiO_4$* | *EtH_3SiO_4*

Considering the relations of ammonia and phosphuretted hydrogen, H_3N and H_3P respectively, and the relations of marsh gas, and siliciuretted hydrogen, H_4C and

H_4Si respectively, there should exist nitrates and carbonates having the general formulæ M_3NO_4 and M_4CO_4 respectively, corresponding to ordinary phosphates and silicates having the general formulæ M_3PO_4 and M_4SiO_4 respectively. It is observable, however, that in addition to ordinary phosphates and silicates, there are other phosphates and silicates, known respectively as metaphosphates and metasilicates, which differ from the ordinary salts by the loss of an atom of base, and that it is these metasalts to which ordinary nitrates and carbonates correspond, thus:

Phosphate	$M_3PO_4 - M_2O =$	$M\,PO_3$	Metaphosphate
		$M\,NO_3$	Nitrate
Silicate	$M_4SiO_4 - M_2O =$	M_2SiO_3	Metasilicate
		$M_2C\,O_3$	Carbonate

But chemists are acquainted with a considerable number of carbonates and nitrates, which may be called orthocarbonates and orthonitrates respectively, that do correspond in their formulæ with ordinary silicates and phosphates, as shown in the table.

ORTHOCARBONATES.

$Ca_4\,CO_4$	Dicarbonate of calcium
$Zn_4\,CO_4$	Dicarbonate of zinc
$Mg_3H\,CO_4$	Dicarbonate of magnesium
$Pb_4\,CO_4$	Dicarbonate of lead
$Pb_3H\,CO_4$	White lead
$Cu_4\,CO_4$	Mysorine
$Cu_3H\,CO_4$	Azurite
$Bi'''H\,CO_4$	Dicarbonate of bismuth

ORTHONITRATES,

$Pb_2H\,NO_4$, $Pb_3\,NO_4$	of lead
$Hg_3\,NO_4$, $Hg_2H\,NO_4$	of mercury
$Bi'''\,NO_4$	of bismuth.

The succeeding tables present lists of the principal ter-oxygen and tetra-oxygen mineral acids. Some of these acids are known only through the medium of their metal- and ethyl- representatives.

TER-OXYGEN ACIDS.

Chloric	$H\,Cl\,O_3$
Bromic	$H\,Br\,O_3$
Iodic	$H\,I\,O_3$
Nitric	$H\,N\,O_3$
Metaphosphoric	$H\,P\,O_3$
Sulphurous	$H_2\,S\,O_3$
Selenious	$H_2\,Se\,O_3$
Tellurous	$H_2\,T\,O_3$
Carbonic	$H_2\,C\,O_3$
Metasilicic	$H_2\,Si\,O_3$
Titanic	$H_2\,Ti\,O_3$
Stannic	$H_2\,Sn\,O_3$
Vanadous	$H_2\,V_2\,O_3$
Phosphorous	$H_3\,P\,O_3$
Arsenious	$H_3\,As\,O_3$
Antimonous	$H_3\,Sb\,O_3$
Bismithous	$H_3\,Bi\,O_3$
Boracic	$H_3\,B\,O_3$
Aluminous	$H_3\,Al_2\,O_3$

TETRA-OXYGEN ACIDS.

Perchloric	$H\,Cl\,O_4$
Periodic	$H\,I\,O_4$
Permanganic	$H\,Mn_2\,O_4$
Sulphuric	$H_2\,S\,O_4$
Selenic	$H_2\,Se\,O_4$
Telluric	$H_2\,T\,O_4$
Oxalic	$H_2\,C_2\,O_4$
Molybdic	$H_2\,Mo_2\,O_4$
Vanadic	$H_2\,V_2\,O_4$
Tungstic	$H_2\,W_2\,O_4$
Chromic	$H_2\,Cr_2\,O_4$
Manganic	$H_2\,Mn_2\,O_4$
Ferric	$H_2\,Fe_2\,O_4$
Orthonitric	$H_3\,N\,O_4$
Phosphoric	$H_3\,P\,O_4$
Arsenic	$H_3\,As\,O_4$
Antimonic	$H_3\,Sb\,O_4$
Orthocarbonic	$H_4\,C\,O_4$
Silicic	$H_4\,Si\,O_4$

Hence the formula $H_x\,R_y\,O_z$, will represent the general type for an acid, where H_x represents the atoms of hydrogen, which, save in carbon compounds, are found to vary only from 1 to 4; where R_y represents the acid radicle, that is the chlorine, or sulphur, or phosphorus, or carbon, &c., which gives the special character to the acid, and which, save in carbon compounds, is usually confined to 1 or 2 elementary atoms; and where O_z represents the atoms of oxygen which generally range from 0 to 4, but occasionally extend to higher numbers.

ON HYDNOCARPUS ODORATUS AND HYDROCOTYLE ASIATICA AS REMEDIES IN LEPROSY, SCROFULA, AND SECONDARY SYPHILIS.

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THE above remedies have recently attracted considerable attention in India, and as the operation of both these medicines on the system is very obscure, as they produce in moderate medicinal doses no uniform marked and immediately sensible effect on any of the functions, and as the evidence of their operation consists chiefly, or solely, on the gradual restoration of health, tone, and vigour of the system generally, we may presume that they act by correcting an abnormal or diseased state of the blood, perhaps acting primarily on the digestive organs, and thus they deserve to be ranked amongst alterative tonics or catalytics.

The first of these, the *Chaulmoogra*, is the seed of *Hydnocarpus odoratus* of modern botanists, the *Chaulmoogra odorata* of Roxburgh (*Flor. Ind. III.*, p. 836), and the *Gynocardia odorata* of the same author, in his *Coromandel Plants*.

This tree, belonging to the natural order Pangiaceæ, is indigenous in Sylhet, Assam, Upper Bengal, and some other parts of India, as well as in China. No notice of this remedy is to be found in the *Taleef Shereef*, in the *Ulfaz Udwiveh*, nor in Ainslie's *Materia Indica*. The first notice we find of its medicinal use, is in Roxburgh's great work (*o. c.*), and he merely mentions the bruised seeds as being extensively used by the natives as an external application in cutaneous diseases. O'Shaughnessy (*Beng. Disp.*, p. 207) made some trials with these seeds. He found them to yield on expression about ten per cent. of a thick viscid oil, of unpleasant flavour and rather unpleasant smell, which, in drachm doses, caused in a dog, to which it was administered, violent vomiting in the course of fifteen minutes. This emetic property of the seeds is likewise noticed by Dr. Irvine in his *Materia Medica of Patna* (p. 72).

In 1853, Dr. Mouat published the results of his use of this remedy in leprosy, and in three cases of which he has furnished the details, manifest benefit resulted from its employment.

More recently it has been employed, also with success, by Dr. Hobson,* Medical Missionary at Canton. It appears that the remedy is known to, and much employed by, the Chinese doctors, not only in leprosy, but in scrofula, in which diseases they consider that it produces a change in the blood. Dr. Hobson thus sums up his own experience of this remedy: "I have seen two cases certainly cured, and several others much benefited; some are still under treatment. The remedy requires to be steadily persevered with for several months; aperients are administered along with it occasionally. The first appearance of improvement is in the eruption becoming less prominent and red, whilst whitish scabs appear around the margin, and the central parts gradually assume the appearance of a healthy skin."

These favourable results, however, are not uniformly met with; thus Dr. Chuckerbutty† found the pills and oil a complete failure in true leprosy, but in scrofula they did good; indeed, in one case, they proved more successful than cod-liver oil; he considers the therapeutic power of the seeds to have been overrated.

Besides the above, Dr. Mouat employed this remedy in a mild case of icthyosis, in three cases of syphilitic rheumatism, in two cases of scrofulous enlargement of the cervical glands, in two cases of elephantiasis of the face, and in a case of leucopatia of ten years' standing, with apparent benefit; but the details are not given, and Dr. Mouat concludes his valuable paper by observing that "the remedy requires a much more extended employment before any sound judgment can be framed of its *modus operandi* and probable value."

The dose is about six grains of the coarsely powdered seed in the form of a pill, gradually increased to three or four times that amount; in large doses it is apt to disagree, causing nausea and irritability of the stomach. The dose of the oil is probably about five or six drops, gradually increased.

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* *Edin. Med. Journal*, July, 1855, No. 1, No. 8, p. 50.
† *Indian Annals of Med.*, iv., p. 190.

Native practitioners direct their patients, whilst taking the Chaulmoogra, to avoid all salt meats, acids, spices, and sweetmeats; but to aid its operation with butter, ghee, and oily articles of diet. It would be well to bear this in mind, and to regulate carefully the diet of all subjected to the use of Chaulmoogra (Mouat).

It is not a little remarkable that the fruit of another species of *Hydnocarpus* has obtained in Southern India a high character amongst the natives as a remedy for leprosy; namely, the *Hydnocarpus inebriens*. For a long period, great doubt existed as to the tree which yielded the *Neeradimootoo* of Ainslie (*Mat. Ind.*, vol. ii., p. 235). Ainslie himself attributed it to a species of Jatropha, and from the Hindostanee name which he adduces, *Junglie Badam*, considerable confusion arose between it and the fruit of *Terminalia Capata*, which is almost universally known as the *Country Almond*, or *Junglie Badam*.

In 1856, I forwarded a flowering specimen of the tree which yields the fruit to Dr. Hugh Cleghorn, then Professor of Botany at the Madras Medical College, and he at once pronounced it to be the *Hydnocarpus inebriens*, which is well depicted in Wight's *Illustrations*, vol. i., table 16. As Ainslie's work is not always procurable, I subjoin his account of the *Neeradimootoo*. "This is an oval-shaped brown nut, about the size of a filbert, but flattish; from its kernel, which has a nauseous smell and taste and unctuous and a little acid, an oil is prepared that is supposed by the native doctors to possess virtues in leprous affections, given in doses of half a teaspoonful twice daily; it for the most part sickens a good deal at first. The kernels and thin shells are sometimes ground together, and being mixed with a little castor oil, are applied externally to cure itch." To this I may add, that in Travancore few remedies enjoy amongst the natives a higher repute than this oil in leprosy, and one of the most intelligent native gentlemen I have ever met with (lately deceased), himself suffering from leprosy, assured me that he had derived more temporary benefit from the use of this oil than from any other medicine.

Recent as is the introduction of the Chaulmoogra into European practice, that of the *Hydrocotyle asiatica* is still more so; and it is not a little remarkable that neither of these two medicines, which promise to be of great value in certain classes of disease, in the character of alterative tonics, should have been appreciated or valued as they deserve to be by the natives themselves. They both appear to have been held as remedies of very secondary importance. The *Hydrocotyle asiatica* is mentioned by Ainslie (*Mat. Ind.*, vol. ii., p. 473), but only with reference to its employment in bowel complaints and fevers, and as a local application to contusions. Horsefield, in his account of the medical plants of Java (*Asiatic Jour.*, vol. vii., p. 264), speaks of it as a diuretic, and as being serviceable in gonorrhœa and gravel, but he does not allude to its use in leprosy. The *Taleef Shereef* contains no notice whatever of the plant.

The *Hydrocotyle asiatica*, a small low growing plant, belonging to the natural order Umbelliferæ, has a very wide range, being common, chiefly in humid, moist localities throughout the peninsula of India, and extending to Assam, Japan, Hong-Kong, Java, Ceylon, Mauritius, the Cape of Good Hope, &c. The names by which it is well known to the natives are *thulkura* [Hind.], *thulkooree* [Beng.], *valarei* [Tam.], *codagam* [Mal. and Canarese]. When fresh it has little or no smell, but when bruised it exhales a peculiar aromatic odour; it has a bitter, pungent, and rather disagreeable taste.

In 1852, Dr. Boileau, a physician residing at the Mauritius, who had been affected with leprosy for many years, accidentally identified this plant with a far-famed South American remedy for leprosy, called *chinchunchulli*, and having tried the remedy in his own person, and having experienced considerable benefit from its use, he administered it to twelve lepers, with a view of testing its supposed virtues. He gave the plant the name of *Bevilacqua*. The results of his experiments were, on the whole, satisfactory, as may be seen from the following report. In a letter, dated March 10th, he says: "I mentioned in my first letter, that twelve lepers were under medical treatment; the number has now increased to fifty-seven. In all these cases, without exception, the progress of the disease has been arrested, as several of my professional brethren of the Mauritius have had an opportunity of observing; and this, too, has been accomplished, after a very short space of time. Up to the present moment, the disease has made no progress for the worse, although two or three have

nearly given up taking their medicine. Amongst the smaller portion of the lepers on whom the new remedy has been tried, especially those who had been recently attacked with the disease, but little improvement is perceptible on the skin, but its influence on the heart, the pulse, and the brain, has been remarkable. Thus young persons, who, under the influence of the disease, had become dull and unfit for anything, who felt as if an enormous weight was attached to their legs, found themselves lighter, and their gait more free, &c. But, in the forty patients more advanced in years, and especially those whose constitutions had been affected by the use of mercury and arsenic, the improvement, both interior and exterior, has been the most remarkable; frightful gangrenous sores have been cicatrized, the spots in the skin are less marked, and the skin itself has become more supple and finer, and has recovered its sensibility. In some instances, the disease has totally disappeared from the surface of the body, and is confined solely to the parts exposed to the air, such as the hands, feet, and face. A few of the patients have pustulous eruptions, with pimples similar to those of the small-pox; these are the persons whose exterior improvements are the most marked."

This and other reports of like tenor were published in the Mauritius newspapers, and one of these having reached Pondicherry early in 1853, M. Jules Lepine, a medical officer of the French Government at that city, soon managed to trace the connexion between Boileau's *Bevilacqua* and *Hydrocotyle asiatica*, which is a common weed in most parts of Southern India.

It is not in leprosy alone, however, that this remedy proves beneficial ; my own experience warrants me in saying that few remedies, not even excepting the iodide of potassium, are more useful than this in secondary and constitutional syphilis. Old long standing cases, especially those where the skin and subjacent cellular tissue chiefly evidence the disease, are often strikingly benefited by its use. On this point Dr. Hunter observes : " The diseases in which it has been found peculiarly efficacious are ulcers, syphilis, and scrofula; nearly all ulcers have been found to heal under a course of this medicine ; amongst the successful cases were many that had long resisted other modes of treatment. Lupus or cancerous ulcers do not appear to heal under its employment, though some cases did derive temporary benefit. Simple ulcers and common cutaneous eruptions are in general speedily cured by its use; syphilitic ulcers are also much benefited, and sloughing ulcers are frequently stimulated to healthy action by its use."

The following is the mode of preparing the plant for use :—The leaves and stalks must be carefully separated and pulled to pieces as soon as possible after the plant is gathered. They must then be spread on a mat in the shade, freely exposed to the air but not to the sun, as this discolours them ; artificial heat drives off a great deal of the aroma of the plant ; thirty pounds of the fresh plant yield between three and four pounds when dry. When thoroughly dry, the plant must be powdered and sifted. The ordinary dose of this powder is from five to eight grains twice daily (the dose I have been in the habit of using is eight grains three times a day); and this appears to be the most active form of administering the medicine. The infusion of ten grains in hot water, and the decoction, are not efficacious; the application of heat appears to dissipate the oil, upon which the efficacy of the plant depends. The infusion of the fresh plant is very pungent and active. The powder sprinkled on the sores often stimulates them to healthy action. In my own practice, I have been in the habit of applying locally cataplasms of the bruised green leaves, and it appears to exercise a very salutary influence on the ulcers. Dr. Boileau and M. Lepine employ also baths, to which three pounds of the green plant are added; also fumigation baths with five pounds of leaves to each. They also advise a syrup, a tincture, and an extract, but it appears that any preparation requiring the application of heat is rendered less efficacious, as the heat causes the dissipation of the essential oil, on which much of the efficacy of the plant depends. M. Lepine subjected the plant to analysis. In 100 parts of the powder he found—

Thick yellow resinous matter soluble in alcohol (18 deg.)	0.40
Thick brown resinous matter soluble in alcohol (30 deg.)	0.85
Dark green resin soluble in alcohol (36 deg.)	2.60
Brownish red extractive (acid)	2.30

Sweet extract	3.20
Gum	2.70
Fecula	4.70
Woody fibre and loss	83.25

By dissolving the resin in alcohol, was obtained a thick pale yellow oil or extract, which appears to be the active principle of the *Hydrocotyle*, and which M. Lepine terms *Vellarine*, from its Tamul name ; it has a sharp, pungent, bitter, and disagreeable taste, with a strong odour similar to that of the plant. It is soluble in alcohol, (freely) in ether, and in fatty substance ; it is neutral to test papers, thickens and becomes darker in dry air, but liquifies in moist air. As a therapeutic agent it has not yet been tried, but its properties deserve investigation.

MEANS OF DETERMINING THE QUALITY OF MILK.

[The following is an abstract of a paper read before the Dublin Chemical Society on this subject by Dr. H. Minchin.]

When we consider that milk enters, in some form or other, into the composition of the food of almost every member of the community, and constitutes the principal, and in many instances the sole, support of the very young, it is of importance that we should be in possession of some means of ascertaining the comparative purity of a fluid holding the essential place which this does as a dietetic substance. Probably but few articles of food are more frequently subject to fraudulent adulteration than the fluid in question. But, although many substances are supposed to have been employed for the purpose of imparting colour or consistence to milk which has been previously diluted, the evidence of very numerous experiments is in favour of the belief, that perhaps, in most instances, the pump is the chief or only contributor; the dealers being quite aware of the fact that, while chalk, starch, flour, and colouring matters can be detected with tolerable facility, the admixture of water will admit of being practised pretty largely, and yet fail to be exposed by the tests ordinarily employed.

To determine with accuracy the quantities of the proper constituents of a given specimen of milk will, of course, require that it be submitted to a chemical analysis, for which purpose an expensive apparatus is necessary, while the process is of necessity both tedious and laborious, and not at all adapted to the requirements of ordinary cases, in which a daily examination must be made.* It therefore became necessary that some more simple method should be devised of estimating approximatively the qualities of this fluid. The several modes of milk-testing which have been suggested are well known, the principal being—1st, the lactometer, or cream-test of Sir Joseph Banks; 2nd, the hydrometer, or specific gravity test; 3rd, the lactoscope of M. Donné; and 4th, the microscope.

It may be necessary to make a few remarks on the use of these several instruments, and first, of the lactometer.

A glass tube of about eleven inches long, and half an inch in diameter, is filled with milk to within a short distance of the top, the surface of the fluid being made to coincide with a transverse line drawn on the tube, and marked zero; the capacity

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* The principal constituents of milk are—cream, or oily matter, casein, or cheese, sugar, saline matters, and water. The proportion of each is variable in different milks; but however the relations of the first four may vary amongst themselves, it may be stated as a general rule, that milk which presents more than 87 per cent. of water is of inferior quality. On taking the average proportion of this ingredient according to the analyses of Simon, Herberzer, Lecanu, Boussingault and Le Bel, Chevalier and Henri, and Haidlen, it is found to be 86.8 per cent.; and, when it is known that the principal, and in many cases the only, fraud practised by dealers in milk, consists in the admixture of water, the first object of the analyst should be to ascertain the per-centage of this ingredient. If 87 be assumed as the standard, a very simple process will in many cases be sufficient to detect the degree of dilution to which the sample has been subjected. Evaporate 100 grains to dryness; ascertain the loss, from which deduct 87; the difference then, multiplied by 100, and divided by 13, will give the per-centage of added water, thus: suppose 100 grains to lose on evaporation 89.6 grains, then 89.6—87=2.6, and 260 divided by 13 gives 20 per cent. of water added.

of the tube from this line downwards is divided into one hundred equal parts or degrees. When the tube thus filled has been suffered to remain undisturbed for a definite time, say twelve hours, or twenty-four hours, the quantity of cream which shall have separated spontaneously during that time is ascertained by an inspection of the instrument held in a proper light, as the inferior limit of the stratum of cream is generally defined with sufficient clearness to enable one to read off accurately the per-centage of this ingredient which has become separated from the milk within the time specified. In using this instrument, it is necessary to observe certain precautions: the milk should be quite fresh, but the tube should not be filled till the milk has cooled down to the temperature of the place where it is destined to remain while at rest; the entire mass of milk should always be well stirred up immediately before the sample to be tested is taken out; the lactometer when filled should be left undisturbed for about twelve hours if the weather be warm, for twenty-four if it be cold.

Milk which has been thus tested is said to show a certain per-centage of cream, and the higher the number of degrees indicated by the lower edge of the cream-stratum, the more of this ingredient is the milk supposed to possess. As far as this goes, nothing can be more simple and satisfactory, if it were only true, but it can be shown that the indications of the instrument in question are fallacious, and calculated to lead to the most erroneous conclusions, especially in the case of those milks in regard to which it is most important that the information supplied by this test should be as accurate as possible—for example, in those cases in which milk is supplied by contract in large quantities to public institutions. The fact is unquestionable that contractors are in the habit of supplying a liquor which they call milk, at a price so excessively low that they must either add a large proportion of water, or sustain a serious loss; and the managers of large institutions are often satisfied to accept this so-called milk at the price agreed upon, provided the lactometer shows a certain per-centage of cream. In reference to the effect which the addition of water to milk exercises on the indications of the lactometer, Dr. Hassall, who has made the analysis of very numerous specimens of milk, makes the following remarks :—

"It is stated," he says, "that the addition of a small quantity of warm water to milk increases the amount of cream: the belief in the accuracy of this statement is entirely erroneous: the addition of water to milk does not increase the quantity of cream; it merely facilitates and hastens, in a most remarkable manner, its formation and separation, as is shown by what follows:

"Six lactometers were filled, one with pure milk, the remainder with the same milk diluted respectively with 10, 20, 30, 40, and 50 per-centages of water.

"In 20 minutes, the lactometer containing pure milk showed but half a degree of cream; in 40 minutes it showed 4°; and at the end of 12 hours it showed 9°.

"The instrument containing 50 per cent. of water showed in 20 minutes 6° of cream; in 40 minutes 6½°; and at the end of 12 hours 5°.

"The rapidity with which the cream was thrown up on the other 4 tubes, viz. those containing 10, 20, 30, and 40 per-centage of water, was proportionally great; the two extreme cases have been quoted merely in order to exhibit more prominently the results which were obtained.

"It thus appears," continues Dr. Hassall, "that the addition of a large quantity of water to milk occasions an almost immediate formation of cream, but does not augment the amount; of this fact, in some cases, it would be an advantage to dairymen to avail themselves. The addition of water to milk of course lessens its specific gravity, and so facilitates the ascension of the cream."*

Now, it would appear from this experiment that we are warranted in deriving a conclusion quite opposed to that just quoted. Here we have 100 parts of pure milk exhibiting 9° of cream; while 50 parts of the same milk mixed with 50 of water, are found to yield 6½° of cream. But the relative proportion of cream existing in the pure and diluted milk is as 2 to 1; while the proportion separable from the two fluids respectively is shown by the lactometer to be as 1.385 to 1 (9 to 6½). It is

* "Food and its Adulterations," p. 329.

plain, therefore, that the per-centage announced by this instrument is not a true index of the richness of the fluid examined.

With regard to the hydrometer, or specific gravity instrument, it is almost unnecessary to say that experience has long since shown it to be quite inapplicable as a means of ascertaining the purity of milk. The normal density of milk has been variously stated by writers, some placing the average density at about 1029, others at 1038, others, again, at some intermediate number. But, whatever may have been the original density of a given sample of the fluid, it is capable of being lowered by the fraudulent admixture of warm water, and raised again to the former figure by the abstraction of a portion of the cream; for the latter will separate rapidly, owing to the previous addition of warm water, and thus the double deception is capable of being carried into effect within a very short period after the milk has been first drawn, and will of course fail to be detected by the hydrometer. It has, therefore, been suggested that the lactometer should always be used in combination with the hydrometer, one being supposed to serve as a check upon the indications of the other.

A very ingenious mode of determining the richness of milk was devised some years since by M. Donné. The instrument which he employed, called a lactoscope, is constructed on a different principle altogether from either of the foregoing, and professes to enable one to judge of the richness of a sample of milk, by measuring the thickness of a film of this fluid through which a luminous body, placed at a certain distance, can be discovered; the more dilute the milk, the thicker will be the film through which the light will be transmitted, and the measure of the thickness is provided for by a scale attached to the instrument.

The chief objections to the employment of the lactoscope, at least for ordinary every-day use, would appear to be not only its high price, but the difficulty of keeping it in good working order, owing to the delicacy of its construction. It requires to be taken asunder every time it is used, and if not thoroughly cleansed and dried in every part, the screw becomes clogged and its action embarrassed; in fact, if it gets into careless or unskilful hands, it will not fail to become, in a short time, unserviceable.

Lastly, of the microscope. With the aid of this valuable instrument the number, size, and shape of the oil, or cream-particles, can be easily recognized by any one who has become expert in its manipulation, and in this way may be formed a tolerably fair estimate of the quality of any given sample of milk; it must be admitted, however, that few, comparatively speaking, have attained to the requisite degree of skill and experience to enable them to pronounce at once a decisive opinion from the use of this instrument without some collateral aid. The expense of a good microscope is also a serious impediment to its general adoption as a lactoscopic instrument.

It will appear, therefore, from what has been stated in the foregoing remarks, that an instrument which, in the hands of ordinary observers, will supply the means of determining approximately, or in a rough way, without much trouble, and in a short time, the comparative richness of milk, is still a desideratum. The practical difficulty which has attended the employment of the several methods of milk-testing hitherto in use, is to be attributed in some measure to the fact that upon any scale that can be devised, upon any principle whatever, there is not one point to which we can refer as a standard of purity. The nearest approach we can make to the establishment of such a standard is to ascertain, by experimenting on several specimens of average quality and known purity, whether we can seize upon some physical property which admits of sufficiently accurate measurement for the purpose; then, it has been ascertained that an inferior quality is indicated when the specific gravity is below a certain range—but this can be raised artificially by the abstraction of some of the cream; an inferior quality is also indicated when the per-centage of cream is less than a certain number; but the instrument employed for exhibiting this per-centage is found to be fallacious, inasmuch as it only shows how much cream has floated to the surface in a given time, and experiment has proved that the richer the milk the less is the cream disposed to float. Many persons are able to judge pretty accurately as to the quality of milk, by carefully observing the transparency which the fluid exhibited when poured in a thin film from one vessel

to another; and it would appear that this property, which has already suggested the instrument of M. Donné, might be again turned to account in the construction of a more simple instrument, which would indicate definitely, and enable us to register numerically, the degree of transparency possessed by a given sample; and we should be thus in possession of a very efficient means of estimating the degree to which the milk had been diluted, or how far it fell short of the average quality.

Such an instrument has lately been invented; the principle of its construction is extremely simple, and the experiments instituted with a view of testing its performance, several series of which have been repeated, appear to have been attended with the most satisfactory and encouraging results. The instrument is made of brass, in the form of a shallow, oblong vessel, capable of containing about an ounce of fluid; the depth of the vessel is made to increase gradually, by means of a slab of white enamel fixed in a gentle slope from one end to the other; this slab is graduated throughout its entire length. Upon this the milk is poured till the vessel is filled, and a cover of plate glass is then put on—this should be done by giving it a sliding motion, to exclude air bubbles. When the vessel full of milk is thus covered, the degree of dilution possessed by the sample under examination is estimated by the number of degrees on the enamel which can be read through the glass cover; for, the glass being in contact with the edge of the enamel plate at one end, and separated from it by a gradually increasing interval towards the other, the intervening stratum of milk is made to assume the form of a thin wedge. If the fluid under examination be of a rich quality, abounding in oily and caseous particles, it will possess such an amount of opacity that only a few degrees can be discovered on the subjacent enamel when the instrument is held opposite to the light; if, on the contrary, the specimen be of inferior quality, whether from innate poverty, or the admixture of water, the diminution of opacity thence resulting will be evinced by the enamel scale becoming visible through a deeper part of the fluid, or at a greater distance from the commencement of the scale; the degree of translucency, therefore, can be measured by the number of lines visible through the fluid.—*From the Gardeners' Chronicle.*

ON THE EXPLOSION OF HYPOPHOSPHITE OF SODA.

BY M. TROMMSDORFF.

Under the heading of "Caution,"* Dr. L. C. Marquart describes a violent explosion of the above salt, while its solution was being evaporated in a porcelain capsule, placed in a heated sand-bath, for which reason too high a heat was assigned as the cause of explosion. It was therefore thought necessary to avoid evaporating such a solution, either over the fire or in a sand-bath, but to employ altogether a water-bath for its evaporation. This operation has been carried on very frequently in my laboratory without the occurrence of the least accident, but last spring I experienced, by a painful accident, that even the low temperature of boiling water is no safeguard against explosions of this salt.

The neutral solution of hypophosphite of soda was evaporated in small portions in a porcelain dish, heated by a simple water-bath, the concentrated liquid being constantly stirred with a glass rod or a porcelain spatula. The last portion had become nearly dry, when a violent explosion took place, breaking all the windows of the laboratory, and seriously lacerating the face of the attending workman. Being near at hand, and supposing the explosion to have been caused by the neglect of the water-bath, I hurried to the spot, but found the bath filled with boiling water, and was unable to discover the least suspicious circumstance from which the cause of the accident might have been explained.

The preparation which the author is using now is of French manufacture, and has a strong alkaline reaction. Should it, in this state, be less subject to explosions, it would be highly interesting to hear of the experience of the French and other chemists with regard to this new medicinal salt, which they are preparing in enormous quantities.—*Chemical News*, June 23.

Archiv. d. Pharm., lxxxv., 384.

ON THE PRESERVATION OF LEECHES.

BY MR. GEORGE GLANFIELD.

The importance of preserving in health and vigour this useful little animal, the leech, has induced me to lay before your readers a plan which I have pursued for some years with unequivocal success.

There are many who, I presume, are not possessed of either an aquarium or "Vayson's Domestic Marsh," for the purpose of keeping leeches, and to them I beg to recommend the following method.

I place the leeches in an earthenware vessel, half filling it with river, or where that cannot be had, rain water; into this I place a handful of well washed tow; I renew the water about twice or three times a week in summer, and once in winter, each time washing the sides of the vessel, and taking the tow out, well washing it under the water-tap, in order to rid it of the epidermis which the leech appears to throw off every few days, renewing the tow occasionally; and by this very simple means I can keep leeches in health far better than by any other plan I have ever adopted —and I have tried many—my deaths not averaging more than half a dozen in so many months, where they used to be that number sometimes in a day during summer.

I can endorse the recommendation of Dr. Frodsham with reference to placing the leeches in camphor mixture after having been used, a plan which I saw years ago pursued, and for hospitals and dispensaries it would prove a great saving.

Torquay.

PATENTED SYPHONS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—In the last number of your Journal appears a letter from Mr. Coffey relative to my Patent Syphon. Will you do me the favour of inserting in your current number my reply?

I am surprised that Mr. Coffey should make so bold an assertion in stating I had made a palpable copy of his invention, and, a little further on, charge me with infringement of his rights. If Mr. Coffey had examined my syphon, he would have found that it was not a *palpable copy*, but a *palpable improvement* upon the one he has been manufacturing, and may even perhaps have been induced to admit those patent laws just, which permit the designer and inventor of improvements to claim the credit as well as the interest which such improvements merit.

I am, Sir, your obedient servant,

Devizes, 14th July, 1860. John Musselwhite.

[We have examined Mr. Musselwhite's syphon, and came to the conclusion that it was a *palpable copy* of Mr. Coffey's well-known patented syphon. The only difference we could discover was a slight and unimportant difference in the stop-cock, the principle upon which the syphon acts being undoubtedly that originally patented by Mr. Coffey.—Ed. *Ph. Journ.*]

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Oxford, June 27th.

The Thirtieth Meeting of the British Association for the Advancement of Science took place in the Sheldonian Theatre. The assembly was not so large as at the previous meeting at Aberdeen, which was partly attributable to the early period of the year chosen.

After a few remarks from the Prince Consort, the presidential chair was resigned to Lord Wrottesley, who then delivered the annual address.

At a previous business meeting held at the Town-Hall, the various reports of the Association were read and received. Mr. Fairbairn has been chosen President for 1861, and Manchester selected for the place of meeting.

The subject of most general interest was Prof. Draper's paper "On the Intellectual Development of Europe, considered with Reference to the Views of Mr. Darwin and others, that Progression of Organisms is Determined by Law," which attracted a very large audience. A very animated discussion took place, in which

the Bishop of Oxford, Rev. Mr. Creswell, and Sir B. Brodie opposed Mr. Darwin's theory, which, on the other hand, was defended by Mr. Huxley and Dr. Hooker.

The officers of the Section devoted to Chemical Science were, *President*, B. C. Brodie. *Vice-Presidents*, Prof. Andrews, W. De la Rue, Prof. Faraday, Prof. Frankland, Prof. Hofmann, Prof. W. A. Miller, Dr. Lyon Playfair. *Secretaries*, G. D. Liveing, A. Vernon Harcourt, A. B. Northcote. *Committee*, Prof. Baumert, Prof. Beale, G. B. Buckton, Prof. Daubeny, Dr. Davy, Dr. Draper, G. C. Foster, A. Gages, J. P. Gassiot, Dr. Gilbert, Dr. Gladstone, W. R. Grove, Rev. W. Vernon Harcourt, Dr. Henry, Prof. Hochstetter, Dr. Matthiessen, Dr. H. Müller, T. J. Pearsall, Prof. Roscoe, Prof. Rowney, Dr. Russell, Dr. E. Smith, T. Spencer, Dr. Stenhouse, Prof. N. Story Maskelyne, Dr. W. K. Sullivan, Prof. Voelcker, J. F. Way.

The communications to this Section were not generally of any great interest, we therefore subjoin a list of the papers read.

Mr. Symons exhibited some forms of Alkalimeters suggested by Mr. Wiers.

On some remarkable Relations existing between the Atomic Weights, Atomic Volumes, and Properties of the Chemical Elements.—J. J. Coleman.

On the Deodorization of Sewage.—Dr. Bird.

On a New Organic Compound containing Boron.—Dr. Frankland and Mr. Duppa.

On the Analysis of some Connemara Minerals.—Prof. Rowney.

On the Transmission of Electrolysis across Glass.—W. R. Grove.

On the Composition of Jet.—Prof. Rowney.

On a New Form of Blow pipe for laboratory use.—Dr. Hermann Sprengal.

On the Occurrence of Poisonous Metals in Cheese.—Prof. Voelcker.

On Waterproof and Unalterable Small-arm Cartridges.—T. Scoffern.

On the Isomers of Cumole; and on a New Acetic Ether occurring in a Natural Resin.—W. De la Rue and Dr. Hugo Müller.

On the Atomic Weight of Oxygen.—Dr. W. A. Miller.

On the Representation of Neutral Salts, on the Type of a Neutral Peroxide HO_2 instead of a Basic Oxide H_2O_2.—Dr. L. Playfair.

Dr. Gladstone communicated some Chemical Notes, the first of which referred to the gradual reduction of hydrate of cresyl into hydrate of phenyl and other compounds through the agency of chloride of calcium or zinc; the second described a crystalline precipitate obtained by the addition of hydrofluorine and molybdous chloride; the third showed by an analysis of the diffusate, that when equivalent proportions of chloride of sodium and nitrate of baryta are mixed together in solution and diffused, four salts exist contemporaneously in the liquid; or, in other words, a portion of each acid combines with a portion of each base.

On some Reactions of Zinc-Ethyl.—Mr. Buckton.

Remarks on the Volume Theory.—Dr. Von Bose.

On Ozone.—Dr. Andrews.

On the Quantitative Estimation of Peroxide of Hydrogen.—Prof. Brodie.

On the Oxidation of Potassium and Sodium.—A. V. Harcourt.

Note on the Destruction of the Bitter Principle of Chyraitta by the Agency of Caustic Alkali.—J. J. Coleman.

On the Composition of the Ash of Wheat grown under various circumstances.—J. B. Lawes and Dr. J. H. Gilbert.

On Thiotherine, a Sulphuretted Product of Decomposition of Albuminous Substances.—Dr. Thudichum.

On the Causes of Fire in Turkey-red Stoves.—Dr. W. Wallace.

ALLEGED POISONINGS BY ANTIMONY.

Thomas Winslow was charged, at Liverpool, with having poisoned Mrs. Ann James, keeper of a boarding-house, with whom the prisoner had lived for some years as manager. The deceased was 42 years of age, and the prisoner was aware she had made a will disposing of the bulk of her property in his favour, and appointing him sole executor. In September, 1859, Mrs. Townsend, sister of Mrs. James, was attacked with vomiting and purging, and died, on the 18th of December, her son, William Townsend, was seized in a similar manner, and died; and on the 11th of January, another son, Samuel Townsend, also died; after suffering from similar symptoms.

In January, Mrs. James was attacked with vomiting and purging, and being

promptly attended by a medical man, she recovered. In March she was again attacked, and recovered, but about the end of May the symptoms returned. Dr. Cameron, her medical attendant, having his suspicions aroused from the frequency of these attacks, took an opportunity of having some of the discharges analyzed by Dr. Edwards, who discovered the presence of antimony. Dr. Cameron then persuaded the patient to consent to be removed to the Hospital, which was acceded to early in June, but notwithstanding every care and attention, she died. A quantity of cooked sago which had been prepared by the prisoner, and of which deceased had partaken, was found to contain antimony. An inquest being held, the coroner's jury returned a verdict of wilful murder against Thomas Winslow, but further evidence being in the possession of the police, application was made to the Secretary of State for the Home Department, to have the other bodies disinterred, in order that the causes which led to their death might be investigated. On Monday, July 9th, the prisoner was brought up on remand before Mr. Raffles, the stipendiary magistrate. Mr. Walter, the solicitor for the prosecution, applied for a further adjournment of the case, as the preliminary investigations had not been completed. He stated that the bodies of Mrs. Townsend and her two sons had been exhumed, and the analysis was proceeding in the hands of Dr. Edwards, who had requested the assistance of Professors Taylor and Miller, of London; and a further remand of the prisoner was accordingly granted.

MISCELLANEA.

Caution to Chemists.—In the case of Farina *v.* Rochfort, tried before Vice-Chancellor Wood, in February last, an injunction was obtained to restrain the defendant, a surgeon carrying on business in Kensington Park Road, from selling spurious eau-de-Cologne, in bottles with labels in imitation of those used by the plaintiff, and of which the plaintiff claimed to be entitled to the exclusive use. It appears that the plaintiff first discovered in January that the defendant was selling spurious eau-de-Cologne in bottles labelled so much like those used by the plaintiff that only a very close inspection showed the difference between the two kinds of labels.

The defendant did not deny the statement of facts in support of the motion, but he said that he had bought the eau-de-Cologne as a genuine article, and was *bonâ fide* selling it as such.

His Honour said the defendant's ignorance that he was selling a spurious article could not displace the plaintiff's right as proprietor of eau-de-Cologne, which had been frequently established in courts of law as well as of equity. An injunction was accordingly granted.

Glycerole of Lead.—This preparation, which is not liable to change, has been recommended in the Journal of the Maryland College of Pharmacy as a substitute for Goulard's Cerate:—

Pure Glycerine	13½ oz. (fluid)
Solution of Subacetate of Lead	2⅔ oz. "
Camphor	1 drachm

Triturate the camphor with a few drops of alcohol; add the glycerine; heat in a water-bath until the camphor is dissolved; when cold, add the solution of subacetate of lead, and shake well together. These proportions are those for Goulard's Cerate, substituting glycerine for the oil and wax.

The proposed Plan for Deodorizing the Thames.—Dr. Letheby, in his Report on the sanitary condition of the City for the quarter ending June 23rd, states, in reference to the proposed plan for deodorizing the river by means of perchloride of iron, that the perchloride is highly charged with a compound of arsenic. A sample of the liquid furnished to him by the patentee, Mr. Dales, and described by him as the same as that used in the experimental inquiries for the Board of Works, yielded from 296 to 297 grains of chloride of arsenic per gallon; therefore, if the sewage of London were deodorized in the way proposed, there would be discharged into the Thames daily as much as 227 pounds of chloride of arsenic. Dr. Letheby observes that although the poison would be diluted with a large quantity of water, and with many millions of gallons of sewage, yet a knowledge of this fact would afford no relief to the apprehension of danger.

Chemical Composition of the Arbutus Fruit.—M. Filhol writes* that the ripe fruit of the arbutus contains an uncrystallizable sugar, which rotates the plane of polarization to the left, reduces the double tartrate of potash and copper, and possesses, in fact, all the properties of fruit sugar. Besides this, the fruit yields to cold water a substance which is precipitated by alcohol in the form of a transparent jelly. When purified by repeated solution and precipitation, it is found to have all the characters of parapectine. It is entirely precipitated from its solutions by neutral acetate of lead, which pectine is not. Parapectine has never before been found in a fruit. A yellow substance very like wax is also found, and a colouring matter which becomes of a beautiful violet tint in contact with potash, and yellow in contact with acids. Lastly, the fruit contains metapectic acid and traces of starch.—*Chemical News.*

Capture of Whales by Means of Prussic Acid.—A very interesting paper has just been published by Professor Christison, the result of some experiments suggested as long ago as 1831 by Messrs. W. and G. Young, of Leith, for the capture of whales by means of poison, the agent being hydrocyanic, or prussic acid. This poison was contained in glass tubes, in quantity about two ounces. Among other difficulties, one was to discharge the poison from the glass tubes at the right time. After various trials, the plan fixed upon was to attach firmly to each side of the harpoon, near the blade, one end of a strong copper wire, the other end of which passed obliquely over the tube, thereby securing it in its place, then through an oblique hole in the shaft, close to the upper end of the tube, and, finally, to a bight in the rope, where it was firmly secured. By these means the rope could not be drawn tight, as it would when the harpoon attached to it struck the whale, without crushing the tubes; the poison would then enter the whale, and death ensue. The Messrs. Young accordingly sent a quantity of tubes charged with the poison by one of their ships engaged in the Greenland fishery, and on meeting with a fine whale the harpoon was skilfully and deeply buried in its body; the whale immediately "sounded," or dived perpendicularly downwards, but in a very short time the rope relaxed, and the whale rose to the surface quite dead; but the men were so appalled by the terrific effect of the poisoned harpoon, that they declined to use any more of them. Subsequent experiments tend to convince the learned professor that success will be established in this method of capturing whales.

Death from an Overdose of Syrup of Poppies.—An inquest has been held at Bacup, on Thomas Francis Doran, infant son of Mr. James Doran, wholesale grocer. It appeared that Mrs. Doran sent a boy, eight years of age, to the shop of Mr. Uttley, chemist and druggist, for some oil of almonds and syrup of violets, the bottle being labelled, having contained a mixture of the same kind before. Mrs. Doran observed that the mixture was of a different colour, and questioned the boy, who said that Mrs. Uttley told him it was all right, but it had lost its colour. The mother gave the child half a teaspoonful, and it went to sleep, and died about three o'clock in the morning. Dr. Stewart was called in before the child died, and on examining the liquid, said it was not what the label on the bottle represented. Mrs. Uttley, on being examined, said she told the boy she had none of what he wanted, but had given him what would do as well, but he must tell his mother not to use so much—four or five drops would be sufficient. It appeared she had given syrup of poppies instead of syrup of violets. The jury returned a verdict of died from an overdose of syrup of poppies.

Suicide by Prussic Acid.—An inquest has been held by Mr. Wakley, at the residence of James Weston, Esq., Government contractor and manufacturer of Roman and Portland Cements, at Millwall. It appeared from the evidence, that some time ago a clerk had been given in charge by Mr. Weston for embezzling about £80. He was remanded, but died before committal for trial. This appears to have preyed upon the mind of Mr. Weston, who was found by the housekeeper in a dying state. A surgeon was sent for, and every means tried to restore him, but death took place in less than half an hour after the arrival of the surgeon. A *post-mortem* examination was made, and it was found that death had been caused by a mixture of prussic acid and ammonia. The jury brought in a verdict accordingly.

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* *Comptes-Rendus*, t. l. p. 1185.

OBITUARY.

We regret to announce the death of another of our Members, Mr. Robert Adolph Farmar, who, in connexion with the late Mr. Smith, took an active part in promoting the formation of the Pharmaceutical Society. In the first volume of this Journal, at page 68, will be found an account of a meeting held at the house of Mr. Farmar, on the 10th of February, 1841, to oppose certain clauses affecting Chemists and Druggists in Hawes's Medical Bill. The measures then adopted may be said to have originated the Pharmaceutical Society, at the formation of which Mr. Farmar acted as joint Secretary with Mr. Smith; and he continued to take a warm interest in the Society up to the time of his death, which took place on the 29th of June last, at his residence, 40, Mount Street, Lambeth. Mr. Farmar, who was one of the Auditors of the Pharmaceutical Society, was fifty-four years of age.

TO CORRESPONDENTS.

A Student of Botany.—Mr. Brocas, of Hart Street, Bloomsbury Square, will supply you with what you desire. We do not know the price.

A correspondent recommends *Tinctura Ferri Muriatis* as a test for the genuineness of essence of coffee, and states that the addition of a few drops of the tincture to an infusion of coffee berries, gives a sap-green colour, which reaction he failed to obtain on the addition of the test to solutions of several specimens of so-called essence of coffee.

Chemicus (Dorchester).—*Blue Dyes.* See our number for April last, page 528.

D. J. (Liskeard),—The addition of a little gallic acid will answer the purpose.

Pharmacopoles (Manchester).—(1.) Yes. (2.) No. (3.) We cannot tell, as the expense would depend in a great measure on the habits of the medical student.

A Country Member (Kingston-on-Thames).—(1.) Biniodide of mercury may be obtained in a crystalline state by sublimation. (2.) Mannite may be prepared by treating manna with boiling alcohol, and filtering the hot solution, when the mannite will crystallize on cooling.

Registered Apprentice (Sheffield).—By Phanerogamous Plants we mean all flowering plants, whether trees, shrubs, or herbs.

A Dyspeptic Baker.—The subject is one more adapted for a medical journal.

A Constant Reader (Bridlington).—Ede's *Practical Facts in Chemistry*, is out of print.

T. H. R. S. (Southampton).—*Chevreul on Colour*, 5*s*. Published by Routledge.

P. H. (Carlisle).—No. 1, *Nephrodium Filix-mas.* No. 2, *Polystichum aculeatum.* No. 3, *Pteris aquilina.* The specimens forwarded are, however, almost too small to be positively identified.

J. B. L.—We should not consider it safe to use the labels sent without attaching a stamp.

Labor Omnia Vincit.—We do not consider the processes of any value.

ERRATA.

Page 80, *for* Rawle, William, Crawley, *read* Rawle, William, Cranley.
" 90, *for* Atkins, Ernest R., *read* Atkins, Ernest.
" 93, *for* Benger, Frederick Benger, *read* Benger, Frederick, Baden.
" 56, *for* Urwick, William W., 33, Denbigh Place, Pimlico, *read* Urwick, William W., 60, St. George's Road, Pimlico

Omitted from the list of Associates who have passed the Minor Examination:—

1858 | 549 | Stewart, James .....Edinburgh

We are requested by Dr. Griffin, of the Bristol School of Chemistry, to correct an error in our last number, page 46. In giving Mr. Herapath's address, we inadvertently put "Bristol School of Chemistry," instead of "Bristol School of *Medicine*." The error was ours.

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, Elias Bremridge, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. Churchill, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.

SECOND SERIES.

VOL. II.—No. III.—SEPTEMBER 1st, 1860.

THE APPROACHING SESSION OF THE SCHOOL OF PHARMACY.

The preparations for improving the accommodation for the School of Pharmacy in Bloomsbury Square are now sufficiently advanced to afford the means of judging of their extent and completeness, and there seems to be no doubt that the plan which has been adopted is the right one, and in every way best calculated to meet the growing requirements of the Institution. The Society, which has so long been identified with Bloomsbury Square, has become permanently fixed and established there, and is provided with a building and arrangements which will admit of the full and ultimate development of all its objects; and this has been accomplished at a cost far less than would have been incurred if premises had been obtained elsewhere for either the whole or any part of its operations. The laboratories, which are nearly finished, are, in extent and with regard to the completeness of the arrangements, unequalled in this country. The new lecture theatre is also of ample size, and capable of affording all the accommodation required in that department. The fittings of these parts of the building are progressing very satisfactorily, and will be finished in time for the opening of the School on the 1st of October. Working places are provided in the laboratory for sixty pupils, and already a considerable number of these have been engaged, so that there is every reason to expect that the approaching session will be one of unusual activity. The advantages presented to the Students will be far greater than those hitherto afforded in the School. The whole suite of laboratories is on one floor, with store-room and balance-rooms immediately beneath it. As heretofore, synthetical and analytical operations will be conducted in different compartments, but the whole are so far united that every pupil will be enabled to observe what is being done by others, and thus to profit to some extent from the experience of those with whom he is associated. This is one of the advantages resulting from studying in a public laboratory, where the pupils not only stimulate each other by the emulation which naturally arises, but afford mutual instruction by the inquiries, suggestions, and results, which all contribute in their daily intercourse.

It may safely be affirmed that a more orderly, industrious, and intelligent class of students does not exist than that which usually assembles in Bloomsbury Square. They have all one ultimate object in view, the completion of their practical and scientific qualifications as Pharmaceutical Chemists. The pupilage to which they have previously been subjected, forms the best possible foundation for a chemical education. They have become acquainted with mos

of the important chemical bodies with which they will subsequently have to work, and they have been drilled into the discipline of business habits, including those of order and neatness in manipulation. They cannot fail to feel the importance to them of becoming thoroughly acquainted with the results of all the operations comprised in the laboratory course, not only as means of enabling them to pass the examinations required for registration as Pharmaceutists, but also to fit them for occupying a higher position in society, and for undertaking professional duties for which they would otherwise be disqualified. In proportion as Pharmaceutists acquire a higher professional standing from increased qualification, they will find remunerative offices and duties for which they are suited. Opportunities for presenting such advantages to well qualified Pharmaceutical Chemists will arise from time to time in the course of legislation, just as has occurred with reference to the medical profession. Why, for instance, should not the analysts under the Adulteration of Food Act be selected from among the Pharmaceutical body? If they were all thoroughly educated in accordance with the scheme of education adopted by the Pharmaceutical Society, they would present better qualifications for that office than any other class of men in the country. We are very glad to find that several of our Members are already candidates for that office, and we hope to see a greater number in a similar position. Pharmaceutical students ought in future to make the qualifications for this appointment an essential part of their professional education. Several applications have been made to the Society on this subject, and provision has been made for giving instruction in chemical analysis, with reference especially to its practical applications in the detection of the adulteration of articles of food and medicine. This forms part of the extended instruction provided for the next session. The courses, as will be seen by reference to the notice on the cover of this Journal, are more comprehensive and complete than heretofore. They comprise all that it is necessary for Pharmaceutical pupils to study, and will occupy, during their continuance, the whole time of those who enter to all the courses.

In arranging the programme of instruction, the Council have endeavoured to meet the requirements of the students attending the School, and to provide means of instruction adequate for the qualification of all, including those whose early tuition has been defective, and who become sensible of this deficiency when their attainments are tested by examination. The services of Mr. Braithwaite and Mr. Wood, who for many years have been, and who still continue, the principal laboratory assistants to the Professor, will be turned to account, the former as Demonstrator of Practical Pharmacy, and the latter as Demonstrator of Chemistry, in giving evening instruction from eight till ten o'clock.

Mr. Braithwaite's course of demonstrations will be an extension of the lessons he has been accustomed to give in Pharmaceutical Latin. We have repeatedly had occasion to notice the deficiency in the school learning of students, whose Latin and arithmetic often fail them when they are required to supply the correct terminations to the abbreviated Latin of prescriptions, or to work out the calculations involved in physical or chemical investigations such as the

accomplished Pharmaceutist may be required to undertake. This course will also comprise instruction in some of the operations of dispensing, for the benefit of those pupils who have had but little experience in such operations.

Mr. Wood's course will be a new feature in the School. It will comprise demonstrations in systematic analysis, with practical applications relating to the detection of adulterations such as occur in medicines and in articles of food. This course will be a valuable adjunct to the laboratory course on the same subject. It will not, however, supersede the necessity for practical working by the student. To those who cannot devote the requisite time for studying analysis in the usual way, by going through a regular course of operations in the laboratory, it will serve to explain the principles and system recognized and adopted by Chemists, and will be useful as a guide and aid to those who are studying the subject at home. The practical applications comprised in the course will include all the most important adulterations of food and medicine, and the use of the microscope, where applicable, for detecting such adulterations.

Without the accommodation afforded by the new lecture-room, the increase referred to in the means of instruction could not have been effected, as the preparations for the morning lectures have to be made on the previous day, and the lecture-room, when used for morning lectures, is not therefore available for other purposes on the evenings immediately preceding; but the new lecture-room being so constructed as to admit of its being divided into two, affords the accommodation required for morning lectures and evening demonstrations. These, together with the laboratory work which extends throughout the day, will fully occupy the time of the pupils.

It is proposed by the new arrangements to provide means of instruction for pupils who wish to attain to a high standard of qualification. It must not be supposed, however, that the increased means provided will enable students greatly to extend their knowledge without prolonging the period of study. The length of time devoted to systematic study has hitherto generally been far short of that required for attaining such a thorough knowledge of the subjects to be learnt as will enable the possessor most permanently to retain and profitably to apply his scientific acquirements. The course of instruction given in the School, by lectures and practical teaching in the laboratory, extends through a period of ten months, and this is the shortest time that students should devote to such study. Even this time, however, is much too short for attaining to any high proficiency, and to encourage successful and meritorious students in further prosecuting their studies, and acquiring the means of distinguishing themselves in after-life, will be one of the objects contemplated in the establishment of the Jacob Bell Memorial Scholarships, which will most likely come into operation in the ensuing year, and will add to the benefits offered to students in the approaching session.

TRANSACTIONS

OF

THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, 1*st August*, 1860,

Present—Messrs. Bird, Bucklee, Davenport, Deane, George Edwards, Hills, Lescher, Morson, Squire, and Waugh.

HENRY B. BRADY, of Newcastle-on-Tyne, was elected a Member of the Council, in place of JOHN B. EDWARDS, of Liverpool, resigned.

JOHN WYMAN, 122, Fore Street, City, was elected an Auditor, in place of ROBERT A. FARMAR, 40, Westminster Road, deceased.

MAJOR EXAMINATION, 21*st August*, 1860.

Bearcroft, Richard James .....Cheltenham
Burton, John .....Nottingham
Clayton, Henry .....Lewisham
Hodges, William .....Ramsgate
Kent, Frederick William .....Southampton

MINOR EXAMINATION.

Bartlett, James .....Bath
Birch, Henry Cooper .....Richmond
Cleave, Samuel Whiteway .....Bodmin
Edwards, William .....
Gething, William Burford .....Lincoln
Hill, Francis .....Leeds
Ridding, William .....London

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS.
Barnett, Thomas James	Mr. Golding	London
Grindley, William	Mr. Grindley	Chester
Harland, Richard Thomas	Mr. Dresser	York
Matthews, Frederick William	Mr. Baker	Islington
Pearson, Henry Jackson	Mr. Hurst	Louth
Sumner, Charles	Mr. Hill	Sheffield

ORIGINAL AND EXTRACTED ARTICLES.

REPORT OF THE
RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION,
AND OF THE
APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

On the Artificial Production of Racemic Acid by the Oxidation of Dulcine.—It will be remembered that some time back M. Liebig discovered tartaric acid among the products of the oxidation of sugar of milk by nitric acid. M. Bohn subsequently examined the acid thus artificially obtained, and found it to possess the same right-handed polarization, and indeed to correspond in every respect with ordinary tartaric acid. When Laurent and Jacquelain were examining the new saccharine principle named *dulcine*, they found it to yield mucic and oxalic acids, when oxidized with nitric acid, like gum and sugar of milk. Upon the discovery of tartaric acid among the products of oxidation of sugar of milk, M. Carlet was induced to examine whether a similar formation took place in the case of dulcine, which, it is seen, agrees with sugar of milk in the general nature of the reaction. The results of his experiments he has presented to the French Academy. As

dulcine itself is without action on polarized light, it was chiefly interesting to ascertain whether tartaric acid, or some of its modifications, would be produced as the result of the action. After several attempts, and some modifications of M. Liebig's process, M. Carlet succeeded in obtaining several grammes of cream of tartar. In all cases the proportion obtained was small, never exceeding $1\frac{1}{2}$ to 2 per cent. of the weight of the dulcine employed.

During the operation the author remarked the formation of a substance presenting the general characters of grape sugar, and which he considered was one of the intermediate products of the reaction. Dulcine is not affected by alkalies, and has no action upon potassio-tartrate of copper, sub-nitrate of bismuth, or indigo; the substance alluded to was coloured by the alkalies, and exercised a reducing action on the other reagents.

The resulting cream of tartar was saturated with carbonate of potash, and precipitated by a salt of lead. The precipitate, diffused through water, was decomposed by sulphuretted hydrogen, and the acid solution allowed to crystallize. A careful examination of the crystals showed them to consist of *paratartaric* or *racemic acid.* Their chemical properties led to the same result. 100 grains of the crystals yielded 10.8 of water, 20.6 of potassium, 27.92 of carbon, and 4.99 of hydrogen. The formula $C_8\ H_6\ O_{12} + 2\ HO$ would give 10.71 of water, 20.76 of potassium, 28.57 of carbon, 4.76 of hydrogen. The solution of the acid precipitated chloride of calcium; the precipitate, dissolved in hydrochloric acid, was again thrown down on the addition of ammonia. Lastly, the solution had no action on a ray of polarized light. Moreover, with the advice and assistance of M. Pasteur, the author succeeded, by forming the cinchonicine compound, in separating from the racemic acid the *left-handed tartaric acid.*

From this investigation it is seen that dulcine, a body without action on polarized light, yields by oxidation racemic acid, which is also without action on the polarized ray, but which can be separated into two substances, each possessing rotatory power, and to an equal extent, but *in opposite directions.* The author infers from this that it is probable dulcine, in common with a number of other neutral bodies, consists of two substances, endowed with rotatory powers, but neutralizing each other. He is therefore following up the investigation.

On the Constitution of Digitalin, Santonin, Guaicum, and Resin of Scammony.—M. Kosmann has recently published* an account of some experiments, undertaken by him with a view of ascertaining the action of certain reagents, principally sulphuric acid, on several organic principles. The result of his investigation has been to show that the bodies digitalin, santonin, guaicum, and resin of scammony, have the composition of glucosides—a result which might have been expected from analogy, and which, in at least one case, has been already indicated.

Digitalin and the Products of its Decomposition.—The author having obtained pure digitalin, first satisfied himself, by the usual processes, that no nitrogen entered into its composition. He then boiled a given weight of the pure and anhydrous digitalin with diluted sulphuric acid for an hour or an hour and a half. After boiling for some time, a white flocculent precipitate formed, the liquid at the same time acquiring a yellow colour. Upon collecting the precipitate upon a filter and weighing, it was found to amount on an average to 47 per cent. of the original substance. The filtered liquid was saturated with carbonate of lime or carbonate of baryta, to remove the sulphuric acid, filtered and evaporated down to the consistence of an extract. The residue was found to possess all the characters of grape sugar. It reduced the potassio-tartrate of copper and underwent fermentation, furnishing alcohol and carbonic acid. The weight of the residue, dried as far as possible, averaged between 57 and 58 per cent. of the digitalin employed. It thus became evident that digitalin, in common with many other substances, is a copulated body, consisting of sugar combined with a new principle, for which the author proposes the name *digitaliretin.* The digitaliretin, which separated as a flocculent precipitate during the boiling, was purified by dissolving it in rectified spirit, filtering, slightly evaporating the solution, and allowing it to undergo

* *Journal de Pharmacie.*

spontaneous evaporation. A deposit took place after some hours, and ultimately a granular mass, of a greyish-white colour, was obtained, which was redissolved in alcohol and again allowed to deposit. Brilliant grains of pure digitaliretin were so obtained.

This substance is almost insoluble in water, to which, however, it imparts a slightly bitter taste. It is only slightly soluble in ether and rectified spirit, but hot spirit dissolves it easily. The solution is bitter, although much less so than digitalin. It slightly reddens blue litmus paper. It is insoluble in the caustic alkalies. Its alcoholic solution is scarcely troubled by an alcoholic solution of acetate of lead, but upon evaporating the mixture a granular precipitate is produced, the liquid at the same time acquiring an acid reaction. By neutralizing this acid with ammonia, a copious flocculent precipitate is formed, which dissolves on boiling and reappears on cooling. When an alcoholic solution of nitrate of silver is added to a solution of digitaliretin, a precipitate slowly forms, composed of small brilliant prisms of digitaliretate of silver, which, by standing for some time, become brown, and on the application of heat undergo decomposition, with the deposition of metallic silver on the sides of the tube.

The author submitted both digitalin and digitaliretin to analysis. The composition of *anhydrous digitalin* accorded with the formula $C_{54}\ H_{45}\ O_{30}$. Hydrated digitalin contains eight atoms of water in addition, the whole of which are driven off at 100° C. Anhydrous digitalin is very hygroscopic, and readily attracts the above amount of water from the air. The analysis of *digitaliretin* gave numbers according with the formula $C_{30}\ H_{25}\ O_{10}$. By adding four equivalents of water to the formula of digitalin, the sum of two equivalents of glucose and one of digitaliretin are obtained; the decomposition of digitalin, as above described, is therefore readily accounted for.

Digitalin	$C_{54}\ H_{45}\ O_{30}$	$= C_{54}\ H_{49}\ O_{34}$
Water	$H_4\ O_4$	
Subtract 2 atoms of glucose		$C_{24}\ H_{24}\ O_{24}$
1 atom of digitaliretin		$C_{30}\ H_{25}\ O_{10}$

Action of Caustic Soda on Digitalin.—The author next studied the action of a caustic alkali on digitalin. This principle could only be dissolved in a moderately concentrated solution of caustic soda by prolonged ebullition. The solution, when effected, had no action on potassio-tartrate of copper; no glucose, therefore, had been formed. Sulphuric or acetic acid was then added, and to the alkaline solution a flocculent precipitate obtained. This precipitate was dissolved in boiling alcohol, the solution filtered and evaporated to a syrupy consistence, when a white crystalline mass was obtained, having a piquant and slightly bitter taste, and an acid reaction on litmus. It consisted of a new acid, which the author has named *digitalinic acid.* The crystals of this acid, examined under the microscope, were found to be brilliant, translucid, micaceous scales. This acid, when treated with dilute sulphuric acid, immediately underwent the same decomposition as the digitalin ; it was split up into glucose and digitaliretin.

Pure digitalinate of soda was prepared by boiling digitalin with a considerable excess of a strong solution of caustic soda for half an hour or more. A crystalline pellicle formed on the surface during ebullition. The solution was afterwards nearly neutralized with sulphuric acid, leaving it, however, slightly alkaline, so as to avoid the decomposing action of the acid on the digitalinic acid. The liquid was then evaporated to dryness, and the residue boiled with spirit, filtered, and the solution allowed to crystallize. A second crystallization furnished the salt in a state of purity.

These two decompositions of digitalin, the one into glucose and digitaliretin under the influence of a dilute acid, the other into digitalinic acid by the action of a strong alkali, show the great necessity for caution in the process adopted for its preparation and purification.

Santonin. — Crystallized santonin, boiled for some hours in dilute sulphuric acid, gradually assumed a resinous aspect, collecting into oleaginous drops, and ultimately agglutinating at the bottom of the capsule. The liquid, when neutralized and tested, gave all the reactions of grape sugar. It is evident, therefore, that

santonin, by this treatment, is resolved into glucose and a new body, which the author names *santoniretin*. The quantity of this substance that was obtained averaged about 87 per cent. of the santonin employed.

Guaicum.—The experiments of the author on this subject are not completed, and a further communication is promised; sufficient data are given, however, to warrant the assumption that guaicum, like the preceding bodies, has the constitution of a glucoside. Purified guaicum resin was boiled for four hours with an excess of sulphuric acid, diluted with six times its weight of water. The liquid became yellow, and the resin agglutinated, at the same time evolving an agreeable odour. After filtration, the liquid was neutralized with caustic soda, and tested with potassio-tartrate of copper, when an abundant formation of the suboxide took place. The deep green resinous substance left insoluble in the acid the author names *guairetin*.

Resin of Scammony.—M. Keller, a German chemist, has already shown that resin of scammony is a conjugated body, and capable of being separated, by the assimilation of water, into glucose and a resin acid. Our present author confirms the results of M. Keller, and further institutes a comparison between the products of the reaction and those obtained from resin of jalap by similar means. MM. Keyser and Meyer have both furnished careful investigations into the constitution of resin of jalap, and their results are adopted by M. Kosmann. They describe two resins: one, insoluble in ether, is principally yielded by the true jalap plant (named in M. Kosmann's paper *Convolvulus Schiedanus*), and is termed *Convolvulin;* the other, soluble in ether, is named *Jalapin*, and is obtained chiefly from the Mexican male jalap (called by M. Kosmann *Convolvulus orizabensis*. These two resins, convolvulin and jalapin, when treated with alkalies, take three atoms of water, and become converted into *Convolvulic acid* and *Jalapic acid*. The formulæ of these bodies are thus stated in M. Kosmann's paper, on the above-mentioned authorities:—

Convolvulin.....	$C_{62}\ H_{50}\ O_{32}$.
Jalapin.....	$C_{68}\ H_{56}\ O_{32}$.
Convolvulic Acid	$C_{62}\ H_{53}\ O_{35}$.
Jalapic Acid	$C_{68}\ H_{59}\ O_{35}$.

Both convolvulin and jalapin, or the respective acids, when treated with mineral acids assimilate water, and separate into glucose, and bodies named respectively *Convolvulinol* ($C_{26}\ H_{24}\ O_6 + HO$) and *Jalapinol* ($C_{32}\ H_{30}\ O_6 + HO$).

The reaction in the case of jalapin is thus expressed:—

$$\underbrace{C_{68}\ H_{56}\ O_{32}}_{\text{Jalapin.}} + 10\ HO = 3\ \underbrace{(C_{12}\ H_{12}\ O_{12})}_{\text{Glucose.}} + \underbrace{C_{32}\ H_{30}\ O_6}_{\text{Jalapinol.}}$$

It will be seen from the above that jalapin and convolvulin represent two terms of an homologous series. M. Kosmann represents resin of scammony or scammonin as an intermediate term in the same series. To do this he adopts the analyses of scammony resin made by Johnston, but rejects the formula of that chemist, and advances the following: $C_{64}\ H_{52}\ O_{32}$. The decomposition of resin of scammony into glucose and a new body is then represented by an equation exactly similar to the one already given for jalapin:—

$$\underbrace{C_{64}\ H_{52}\ O_{32}}_{\text{Scammonin.}} + 10\ HO = 3\ \underbrace{(C_{12}\ H_{12}\ O_{12})}_{\text{Glucose.}} + \underbrace{C_{28}\ H_{26}\ O_6}_{\text{Scammoniol ?}}$$

The following simple relations between these resins and their derivatives is also obtained:—

Convolvulin	$C_{62}\ H_{50}\ O_{32}$	Convolvulinol.....	$C_{26}\ H_{24}\ O_6$
Scammonin	$C_{64}\ H_{52}\ O_{32}$	Scammoniol	$C_{28}\ H_{26}\ O_6$
Jalapin	$C_{68}\ H_{56}\ O_{32}$	Jalapinol	$C_{32}\ H_{30}\ O_6$

It must be remembered, however, that no analysis of the so-called *Scammoniol* appears to have been made.

M. Kosmann thinks he is further justified in connecting the resins of jalap and

scammony together by the known botanical relations existing between the plants from which they are derived.

The author alludes to the process recently introduced by Prof. Williamson in this country for the preparation of resin of scammony, and considers that the resin must become, at any rate to some extent, altered in its composition, by the boiling in acidulated water, which forms part of the operation.

Means of recognizing Ergot of Rye.—M. Wittstein has recommended a means of recognizing ergot of rye when mixed with farinaceous substances, depending on the disengagement of trimethylamine, which takes place when ergot of rye is mixed with solution of potash. The suspected substance is mixed with a little water, introduced into a tube, and covered with a layer of solution of caustic potash. In a little time an unmistakable odour of brine is developed, which is increased by heat, but is then quickly dissipated.

ON THE PROXIMATE ANALYSIS OF PLANTS AND VEGETABLE SUBSTANCES.

BY FREDERICK ROCHLEDER, M.D.

(*Continued from page* 135.)

Before I pass to the examination of the precipitates which are produced in a portion of the watery decoction by alum and ammonia, I have still to mention the means by which a separation of the substances in some cases is effected which are obtained from the precipitates developed by sugar of lead and vinegar of lead, in a condition free from lead, according to the method previously given.

These are substances which *per se*, or by the agency of other bodies with which they are mixed, are soluble in water in rather considerable quantity. *Many of these bodies lose their solubility* in a considerable degree *when they are completely dried*, or then dissolve only very slowly in water; while drying on many other bodies exercises no influence of that kind on their solubility. Consequently it is often a good method, to obtain the greatest part of a substance in a state of separation from the other bodies accompanying it, to allow the mixture to thoroughly dry *in vacuo* at least over sulphuric acid, to treat the dried mass with a little cold water, and then by stirring and trituration to bring the dried mass into close contact with the water. One of the constituents often then remains in the form of microscopic crystals or as an amorphous powder, at least for a short time, undissolved, and can be separated from the other bodies easily and quickly soluble in water by a rapid filtration.

We will now apply our attention to the *precipitates* which are thrown down by *a solution of alum and ammonia from a portion of the watery decoction.*

The *precipitate* washed on the filter with water is heated with *dilute sulphuric acid*, and allowed to remain some time in contact with the same, accompanied with frequent stirring. For this purpose, the precipitate on the filter is introduced into a capacious glass vessel. The solution is filtered from the portion remaining undissolved, and this is washed on a filter with water. The residue washed with water is treated with *hot alcohol*, wherein most substances dissolve. These can be precipitated from the alcoholic solution by *water*, and after being washed with water, may be preserved for a closer examination by being dried *in vacuo* over sulphuric acid.

The solution obtained by the application of dilute sulphuric acid is mixed with a saturated solution of *sulphate of potash*, whereby the alum is re-formed, and at the same time is partially precipitated. The fluid is mixed with *anhydrous alcohol* as long as an addition of the same produces a precipitate of alum and sulphate of potash, and the spirituous liquid is filtered from the precipitate. The quantity of sulphuric acid which is still present in the fluid in a free condition is separated by the introduction of moist *white lead*, prepared by passing carbonic acid into vinegar of lead. The sulphate of lead is separated by a filter, and the small quantity of lead dissolved removed from the liquid by sulphuretted hydrogen. After filtering off the sulphuret of lead and expelling the sulphuretted hydrogen, the alcohol is distilled off, and the watery residue employed for further investigation. It is self-evident that the greatest portion of the substances contained in this fluid are those which were

precipitated by sugar of lead and vinegar of lead from a portion of the watery decoction, with the exception of those which are not precipitated with alum, or remain undissolved by the treatment of the aluminous precipitate with dilute sulphuric acid. This fluid is therefore treated exactly as is above described with the first portion of the watery decoction—namely, with sugar of lead and vinegar of lead, and the resulting precipitates are examined in precisely the same manner.

It was mentioned before that a part of the watery decoction was to be treated with animal charcoal, and the charcoal washed with water extracted with boiling alcohol. This alcoholic extract may contain colouring matters, indifferent bodies, organic bases, &c. After its evaporation, either *crystals* are separated which can be removed from the mother liquor, or no crystals are formed. The whole residue, when no crystals have separated, or the mother liquors from which the crystals have been removed, must now be subjected to a more minute investigation. The examination of the mixtures of substances which are contained in the fluids which are filtered from the precipitates produced by sugar of lead and vinegar of lead in one portion of the watery decoction, and from the precipitates caused by alum in a second portion of the same, is facilitated when the former are freed from lead by sulphuretted hydrogen, and the latter from sulphate of potash and ammonia, by alcohol, and then distilling off the alcohol. Organic bases, many bitter bodies, and other substances, may likewise be contained in those fluids, as well as in the alcoholic extract of the animal charcoal. *The concentrated residue of this alcoholic extract is diluted with water.* Should a body difficultly soluble in water be thereby thrown down, it should be collected on a filter. A small portion of the watery fluid is now mixed with a *solution of sugar of lead*, by which a precipitate often results, because colouring matters and other bodies possess the character of weak acids, and afford, with lead, insoluble compounds. The *fluid filtered* from the precipitate resulting from sugar of lead is mixed with *vinegar of lead*, to observe whether a precipitate thereby ensues or not. If a precipitate results, it is separated by a filter from the fluid, and this is freed from lead by sulphuretted hydrogen, the sulphuretted hydrogen expelled, and the fluid evaporated to ascertain whether a residue remains, which is generally not the case, as sulphuret of lead frequently retains the bodies which were taken up by the charcoal from the watery solution. On this account the sulphuret of lead must be extracted with hot alcohol, and the hot liquid filtered from the sulphuret of lead in a hot-water funnel. *Both precipitates* resulting from sugar of lead and vinegar of lead are *boiled with alcohol* to ascertain whether they dissolve partially or entirely in alcohol. The solutions, if resulting, are treated with sulphuretted hydrogen, the sulphuret of lead heated to the boiling point with the spirit, and filtered hot. In the spirit with which the precipitate was heated, which resulted from vinegar of lead, an organic base, or a mixture of several such bodies, may be easily detected. The *portion of the lead precipitate remaining undissolved in boiling alcohol* is diffused through alcohol, decomposed by sulphuretted hydrogen, the fluid heated with the sulphuret of lead, and filtered hot. These different fluids are evaporated in a water-bath, and the residues preserved for further examination with reagents.

Having spoken of the treatment of the precipitates which are produced by sugar of lead and vinegar of lead in one portion of the watery decoction, and by alum and ammonia in another portion, and described the treatment of a part of the watery decoction with animal charcoal, we will now direct our attention to the *residues* which have been obtained by the methods already related *from the watery decoction after treatment by the two salts of lead or alum and ammonia, and after the substances precipitated by these means have been separated from the lead by sulphuretted hydrogen, and the sulphate of potash and ammonia by alcohol.*

It was mentioned previously that sometimes *crystals* will separate from the *residues* which by the evaporation of the water or the spirit are left behind, and that these crystals should be removed from the mother liquors from which they have separated.

When the crystals have been separated from the mother liquors, *their degree of solubility* must first be ascertained. That they are soluble in water is evident from their method of preparation, although they may be difficultly soluble in water. The presence of other substances in the watery decoction may considerably increase their

solubility in water. If the same crystalline mass had formed from the residues which were obtained from the watery decoction by the salts of lead as from the residues which remained after the treatment of the watery decoction by alum and ammonia, it results that this crystalline mass, which may be one body or a mixture of several substances, is quite as soluble in *alcohol* as in water, because, had it been insoluble in alcohol, it would have been left behind, by the separation of the sulphates of potash and ammonia by anhydrous alcohol, with these sulphates as an insoluble body. It still remains to be ascertained whether the crystalline mass is quite or partially soluble in *ether*, as well as whether *acidulated water* dissolves more of it than pure water. When the degree of solubility has been learnt by these experiments, a method is afforded which had to be found to purify the still impure crystals by recrystallization before they are further investigated.

We first ascertain, with a very small quantity of *the crystals purified by recrystallization, whether they can be partially or entirely sublimed or not, altered or unaltered.* The experiment, which gives in most instances a negative result, can be performed between two small watch glasses fitted to one another. According to the researches of Sonnenschein, phosphor-molybdic acid is a good test to prove the presence of bases. It gives with all bases, almost without exception, precipitates as well with the oxygenated as the non-oxygenated ones; these are generally yellow, but sometimes coloured brownish yellow. This compound is prepared by heating molybdate of ammonia with *c* phosphate of soda, suspending the well-washed precipitate in water, and heating it with carbonate of soda until it is completely dissolved. This solution is evaporated to dryness, and then heated to redness, for the complete expulsion of the ammonia. If the molybdic acid is thereby partially reduced, the heated residue is moistened with nitric acid, and again heated to redness. The resulting dry saline mass is heated with water, nitric acid is added to produce a strong acid reaction, and then with so much water mixed, that ten parts of the solution contain one part of the dry saline mass. This golden yellow fluid, after filtration, must be preserved, excluded as much as possible from the influence of ammoniacal vapours.

To arrive at the nature of these crystals in a pure state, we proceed further, in the following manner:—

We first ascertain *whether an organic base, or a mixture of several organic bases, as an acetate or acetates, is contained in the crystalline mass.* To detect these bodies, a portion of the separated crystals is employed, and this is divided into four equal parts.

The *first part* is dissolved in the smallest required quantity of water, and a few drops of hydrochloric acid are added to the solution, and *chloride of platina.* If no precipitate ensues, a little hydrous alcohol is added, and then if no precipitate results, a small quantity of ether. The resulting precipitate (if any) is separated by a filter from the fluid, and washed with a mixture of anhydrous alcohol with a little ether. The dried precipitate is tested, to ascertain whether it contains potash or not, by heating it to redness, and extracting the platina residue with water, and testing for the potash therein, which must be present as chloride of potassium if the crystals contained potash. It is well to examine the portion of crystals employed, to learn their capacity for sublimation, to ascertain whether the residue generally remaining is completely burnt, and, when it leaves an ash, whether potash is present therein.

The *second part* of the solution is mixed with a solution of *bichloride of mercury.* By this means there are several bases precipitated—for example, emetine, &c.

The *third part* of the solution is mixed with a concentrated solution of *caustic soda* in very small quantity. If the crystals of the acetate were, as far as the base is concerned, difficultly soluble, or if they contained a little of one or several such salts, the base would be precipitated from its concentrated solution by the alkali, after the neutralization of the acetic acid. In an excess of the alkali, the precipitated base is frequently more soluble than in pure water, therefore the alkali must only be added by drops. Instead of *caustic soda*, carbonate of soda can be employed.

The *fourth part* of the solution is *heated after the addition of an alkali*, and it is ascertained whether the vapour thereby evolved is alkaline. Such a vapour may result when a volatile base is present whose acetate is crystallizable, or when the crystals were, or contained a body analogous to, asparagine; in the latter case, ammonia is evolved under the given conditions.

If we have found by this examination whether basic bodies are present or not, it is necessary, in the case of bases being present, to ascertain *whether one or more bases are at the same time present.*

Many vegetable substances contain only a single base. The berries and leaves of coffee contain only caffeine, the berries of cocoa only the bromine, &c. But in cinchona bark, quinine and cinchonine are present; in the strychneæ, brucine and strychnine, besides another base. The papaveraceæ contain at the same time three or more bases.

By the investigation of the degree of solubility, the opportunity has in many cases been given to learn whether we have to do with one or several bodies. To arrive at certainty on the point, the following method of examination is preferable to all others, which is founded on a discovery made by Persoz, and first recommended by C. Oppermann as a method for separating several bases from one another:—

The concentrated aqueous solution of bases is mixed with *tartaric acid*, and then *bicarbonate of soda* is added. Oppermann has found that by this method of treatment quinine, morphine, and brucine are not; on the contrary, cinchonine, narcotine, and strychnine are, precipitated. Thus, in many cases when two bases are present, a separation of one from the other may be effected by this method. By mixing the fluid filtered from the precipitate which may have been produced by bicarbonate of soda with a little hydrochloric acid, and then adding chloride of platina and alcohol, it can be readily determined whether a base still remains in the solution or not.

If we learn by this treatment that several bases are present, we must still ascertain *whether the precipitated part and the non-precipitated part* consists of *one or more bases.* This examination depends on the principle of *fractional precipitation, and the estimation of atomic weights which are undertaken with the individual portions of the precipitated bases.* For the performance of this examination thirty or forty grains of the substance to be tested is necessary. The part of the solution precipitable by mixture with tartaric acid and bicarbonate is first separated from the unprecipitable part and collected on a filter, then dissolved in dilute hydrochloric acid, and half the quantity of the solution of bicarbonate of soda is added which was required to throw down the entire quantity of bases. This quantity should be previously ascertained with small measured quantities of the solution of the bases and bicarbonate of soda. It is evident that the hydrochloric acid solution of the bases must be quite neutral—that is, contains no excess of acid.

The substance separated by the first half of the precipitant, and the precipitate produced by the second half of the same, are collected on filters and washed, then dissolved in dilute hydrochloric acid, and mixed with chloride of platina and alcohol. Both the platina precipitates are washed with alcohol mixed with ether, dried, and heated to redness.

From the quantity of platina remaining behind, it will be seen whether one or more bases are present. A closer examination with reagents whose behaviour to bases is known, may first be performed with good results when the separation of the different bases has been thus approximately attained.

If we have by these means learnt that the separated crystals are not an organic base, or a mixture of such bases, or rather their salts, with acetic acid, they must be therefore an indifferent organic body, or rarely a mixture of several substances of that kind. The presence or absence of nitrogen—that is, the presence or absence of a body perhaps analogous to asparagine—has been already decided by the experiment with the concentrated solution of caustic soda in the heat.

The preponderating majority of these indifferent vegetable substances has been proved by careful investigation to belong to the class of copulated carbohydrates—as, for example, salicine, phloridzine, populine, arbutine, ononine, æsculine, &c. It is therefore our problem to ascertain whether the crystals in question belong or not to this class of bodies—that is, whether by acids (when these do not act in a too concentrated form at high temperatures) they are split into two products, one of which—a carbohydrate—is in the majority of cases sugar, or a similarly composed body. By the action of alkalies on these bodies, two products likewise result—one which is in exceptional instances sugar, but in the majority of cases a carbohydrate, with properties different to those of sugar. Frequently the salt of an acid results, and a product which is decomposed by acids into two products, one of which is sugar.

To ascertain whether a copulated carbohydrate of that kind is present, the crystals under examination are treated in the following manner :—

They are dissolved in the smallest possible quantity of water, and the solution is mixed with a small quantity of *strong hydrochloric acid*, the acid solution is introduced into a flask, and the air drawn out by a stream of carbonic acid gas. The flask is heated on a sand-bath until its contents boil. To intercept the volatile products of decomposition perhaps evolved, the flask is connected with a refrigeratory apparatus and a receiver. In many cases while heating, and in others after cooling, the fluid boiled for some time deposits a product of the decomposition sometimes in the form of distinct crystals, sometimes in the form of amorphous flocks, or in a state of powder. Occasionally a dense oily or resinous mass is deposited, which sometimes, after long standing, becomes crystalline. When *an insoluble* or difficultly soluble decomposition product is separated after the fluid has cooled, this is collected on a filter. It is advisable to cool the fluid down to 32° Fahr., to effect thereby a more complete separation. The filtered acid fluid is then mixed with freshly precipitated moist *carbonate of lead*, until, upon the addition of this salt, no more effervescence takes place. The solution containing the chloride of lead in solution, together with the undissolved chloride of lead, is poured into a basin, heated on a water-bath, and in small portions *freshly prepared or still moist* white lead is added. A basic lead salt of very slight solubility results. As soon as by the addition of a fresh quantity of white lead no more change is remarked, the contents of the basin are placed on a filter. The filtered fluid is mixed with *phosphate of silver*, which is prepared by precipitating a solution of phosphate of soda of the Pharmacopœias with a solution of nitrate of silver, and which is preserved *in a moist state*, excluded from the light. As soon as the phosphate of silver and the dissolved chloride of lead come into contact with one another they are decomposed into insoluble chloride of silver, and into insoluble phosphate of lead. The phosphate of silver is consequently added until the yellow colour of the silver salt no longer disappears; the precipitate in the fluid thus assumes a yellowish colour. The fluid is filtered from the precipitate, which is washed. The filtered fluid, together with the small quantity of washings, is mixed with pure white lead into a paste, and gently heated for a short time. The white colour of the milky fluid begins to pass into a reddish grey by the decomposition of the phosphate of silver, which is soluble in a small quantity in water. The fluid filtered from the insoluble contents is freed from a trace of lead by sulphuretted hydrogen, separated from sulphuret of lead by filtration and evaporated in a water-bath. If sugar has formed by the treatment with hydrochloric acid, it is obtained as a syrupy sweet mass which crystallizes after standing some days, but requires occasionally some weeks.

When, by the treatment with hydrochloric acid in the heat, *no decomposition products insoluble or difficultly soluble* have separated, and in the receiver furnished with a refrigeratory apparatus *no volatile products* are to be found, then either no decomposition has ensued, or *both the decomposition products are easily soluble in the water containing hydrochloric acid.* To discover whether soluble decomposition products have been produced, the acidulated fluid is mixed with dry carbonate of lead as long as effervescence results by the addition of a fresh quantity of the carbonate. The hydrochloric acid has a decomposing action on the carbonate of lead, and forms chloride of lead under the development of carbonic acid. The decomposition products of indifferent copulated compounds do not attach in the cold carbonate of lead in the majority of cases, because a strong organic acid seldom results from the decomposition of these bodies. Only in the heat do these bodies decompose carbonate of lead. On the contrary, they decompose more readily the freshly precipitated moist carbonate of lead, or that preserved in a pasty wet state after precipitation. The chloride of lead is filtered from the liquid, and thus much hydrochloric acid is separated. The fluid is now concentrated in a water-bath, whereby, especially after cooling, the greater part of the chloride of lead contained in the fluid separates. The separated chloride of lead is filtered off dry, and after it has been well pressed between bibulous paper frequently renewed, it is heated to learn whether it is mixed with an organic substance, which is generally not the case. Should an organic lead compound be admixed with chloride of lead, it is ascertained whether it can be extracted with alcohol from the chloride of lead, wherein the latter is insoluble. When

the organic lead compound is not soluble in alcohol, the chloride of lead mixed with the organic lead compound must be decomposed under water by sulphuretted hydrogen, by which means the organic substance and hydrochloric acid are obtained in the fluid filtered from the sulphuret of lead. A small quantity of this fluid is mixed with *baryta water*, to ascertain whether, besides chloride of barium, which remains in solution, a baryta compound of the organic substance, insoluble in water, results. When this is the case, the solution containing chloride of barium is filtered from the baryta compound, which is washed with water, and the organic body which was combined with the baryta, that is, the pure decomposition product, is obtained by decomposing the baryta compound with dilute sulphuric acid. As chloride of barium is almost insoluble in quite anhydrous alcohol, and the majority of the baryta compounds of organic substances, on the contrary, dissolve with great difficulty in weak spirit, we can, when baryta water produces no precipitate in the hydrochloric acid fluid, add absolute alcohol, whereby a baryta compound of the decomposition product is often thrown down before the chloride of barium separates.

It is self-evident that the fluid containing hydrochloric acid, which is obtained by heating the aqueous solution of the crystals under examination with a little hydrochloric acid, may be mixed with baryta water, to observe whether a precipitate, that is, a compound of the decomposition product, insoluble in water, is thereby formed or not; in the latter case, the addition of a little anhydrous alcohol assists the precipitation. If a precipitate is not produced either by baryta water alone, or by baryta water and alcohol, a second portion of fluid, containing hydrochloric acid, is taken and mixed with freshly precipitated *carbonate of silver*, which is converted into insoluble chloride of silver by the hydrochloric acid, under the evolution of carbonic acid. The chloride of silver is separated by filtration from the fluid, which is now free from hydrochloric acid. Two cases can hereby happen. Either there results, besides the chloride of silver, the silver compound of a decomposition product insoluble in water or not. If no insoluble compound of a decomposition product with silver has separated with the chloride of silver, the filtered fluid contains silver or not. If it contains silver, the silver must be separated by sulphuretted hydrogen; then we have a watery solution of both decomposition products. If it does not contain silver, the filtrate is a pure solution of decomposition products. Of their further treatment we shall directly speak. When a decomposition product is precipitated, together with chloride of silver, as an insoluble silver compound, and filtered off, the filtered fluid is a solution of sugar, or a solution of a carbohydrate with the same composition as sugar. When the solution of both decomposition products is obtained in a condition free from hydrochloric acid, we must endeavour to effect a separation with *chloride of tin*, or with *basic acetate of lead*. Many of the decomposition products appearing with sugar are precipitated by chloride of tin, and most of these bodies are thrown down by basic acetate of lead. The tin and lead compounds obtained may be decomposed by sulphuretted hydrogen, after they have been diffused in water. The fluid filtered from these tin and lead compounds, after treatment with sulphuretted hydrogen, can be employed for obtaining the sugar.

If the research which has been made with both portions of the fluid under examination has led to no result, a third portion of the fluid, containing hydrochloric acid, is taken and mixed with a solution of *sulphate of silver* as long as a turbidness arises from precipitated chloride of silver. The chloride of silver is removed by filtration, the fluid containing sulphuric acid is mixed with baryta water as long as sulphate of baryta separates, and by filtration a solution of both decomposition products is obtained free from acid.

Another method, which in many cases is easy of execution, depends on the behaviour of many bodies to alumina. The hydrochloric acid of the fluid is precipitated completely with the solution of sulphate of silver; the fluid, now containing sulphuric acid, is mixed with the hydrate of alumina in a moist condition, and ammonia is added to the solution. If a precipitate results which contains the decomposition products obtained with sugar while the sugar and sulphate of ammonia and a little free ammonia remains dissolved in the fluid, this solution is evaporated, and the residue, when it has acquired a syrupy consistence, is mixed with anhydrous alcohol. The sulphate of ammonia remains undissolved, whilst the sugar is taken up by the alcohol containing a little water, and, after evaporation, remains behind.

If a volatile decomposition product results by the treatment of the crystals with dilute hydrochloric acid in the heat, this is contained in the receiver which was connected with the flask by means of a refrigeratory apparatus wherein the boiling with the acidulated water took place. A small portion of the fluid is mixed with carbonate of soda as long as effervescence results with this salt, and is then distilled. If the distillate is pure water, the decomposition product is an acid. On the contrary, if the decomposition product is not an acid, it passes over by distillation, while the hydrochloric acid remains in the residue as common salt. When an acid has been obtained, to obtain it free from hydrochloric acid the distillate is mixed with sulphate of silver as long as chloride of silver is thereby precipitated. The chloride of silver is removed by filtration, and the fluid containing sulphuric acid is distilled, by which the acid distils over with pure water.

When we have determined by the above described examination whether the substance under investigation by the action of hydrochloric acid* is decomposed or not into sugar and a second product at an elevated temperature, we have still to ascertain *whether by action of an alkali in the heat an analogous decomposition* is effected or not. Many bodies afford, by the treatment with baryta, a carbohydrate, and the same decomposition product which is obtained by treatment with hydrochloric acid. The tannin of galls affords gallic acid as well by the treatment with hydrochloric acids as with baryta water. Others behave in this respect differently. Æsculine gives, when heated with hydrochloric acid, æsculetine ; on the contrary, by treatment with baryta water, no trace of æsculetine is obtained. With reference to the carbohydrates, the copulated substances behave likewise similar and dissimilar. The tannin of galls treated with hydrochloric acid gives crystallized grape sugar; on the contrary, by treatment with baryta water, a carbohydrate with the decided character of an acid. The thujine from the green parts of *Thuja occidentalis* treated with hydrochloric acid affords a non-crystallizable carbohydrate; on the contrary, by treatment with baryta water, crystallized grape sugar. Independently of this difference, a number of substances still exists which, by treatment with baryta, do not set free a carbohydrate, as is the case by the action of hydrochloric acid, but an acid results which combines with the baryta, while a substance is formed which, by the action of acids, affords sugar and a second decomposition product. Thus populine, by treatment with baryta, gives besides benzoate of baryta, salicine, and ononine, besides formiate of baryta affords formonetine. Salicine as well as formonetine are copulated sugar compounds.

It will be seen from the examples cited that the behaviour of a substance of that kind to hydrochloric acid renders in no way superfluous the study of its relations to an alkali.

(*To be continued.*)

CHEMICAL EXAMINATION OF KAMALA.

BY G. LEUBE, JUN.†

Translated (with some abridgment) by Daniel Hanbury.

The red powder which, under the name of *Kamala*, has recently been introduced into Europe as a vermifuge, and which was described at some length in the *Pharmaceutical Journal* for February, 1858, has been subjected by the author to a careful chemical examination, the results of which differ in several points from those obtained by Professor Anderson of Glasgow, by whom also the substance was analyzed.‡ The author's attention was first arrested by the extraordinary quantity of ash obtained upon the incineration of Kamala, which he found to amount to 28.85 per cent., while that recorded by Professor Anderson was only 3.84 per cent. This

* The hydrochloric may in these investigations be replaced by sulphuric acid with one exception, as the latter can be more readily removed when the decomposition has been completed. But in general the decomposition proceeds more slowly and less completely, and often not at all, with sulphuric acid than with hydrochloric acid.

† *Chemische Untersuchung des neuen Wurmmittels "Kamala,"* von G. Leube, jun. *Vierteljahresschrift für Praktische Pharmacie*, Bd. ix., Heft 3 (1860).

‡ Anderson on the colouring matter of *Rottlera tinctoria*, *Edinburgh New Philosophical Journal*, Jan.-April, 1855, p. 296.

circumstance, coupled with some other discrepancies between his own observations and those of Professor Anderson, induced him to undertake a more thorough examination of the substance.

Kamala constitutes, as is well known, a red, non-coherent powder, whose particles readily roll over one another like those of Lycopodium; it is obtained by brushing from the surface of the tricoccous fruit of *Rottlera tinctoria* Roxb. (*Euphorbiaceæ*), the bright red glands and stellate hairs with which it is covered. When examined under the microscope, it presents the appearance of irregular, garnet-red, semi-transparent, mostly roundish grains, mixed with stellate hairs as well as with unmistakable grains of sand. The last named can scarcely be regarded as an adulteration, but rather as accidental impurity, since the fruit may become covered with dust by the wind, or having been collected from the ground, it may have unavoidably become contaminated with the sand with which it was in contact. But even should the specimen examined by the author have been not quite pure (and he asserts that it was perfectly free from inorganic colouring matter, as oxide of iron, ochre, &c.) he contends that it is hardly possible to reconcile the per-centage of ashes he obtained with that recorded by Professor Anderson.

I. The author commenced his examination by the exhaustion with ether of 50 grammes of Kamala, which by this treatment were reduced in weight to 26.85 grammes. The ethereal solution upon evaporation deposited nothing, but retained a uniform fluidity until it dried up into a resinous mass. This resinous mass was exhausted with boiling water, and, having been again dried, was found to weigh 22.8 grammes. The aqueous solution was found to contain traces of citric and tannic acids; it was tested for ammonia, lactic acid, and sugar, but with negative results.

II. The 26.85 grammes of residue, which had the colour of hydrated oxide of iron, were next treated with alcohol, sp. gr. .8332, until thoroughly exhausted; the solution, upon evaporation, yielded a small amount of brittle resin, which was almost entirely soluble in ether or ammonia.

III. After treatment by alcohol, the residue, which weighed 25.46 grammes, was digested with cold water: a little of the water was heated to a boiling temperature, but remained clear, as well as after acidulation with hydrochloric acid, whence the absence of albumen was inferred. The whole quantity was then boiled, and the decoction having been thrown upon a filter, the insoluble residue was dried and found to weigh 23.45 grammes. The filtrate contained traces of starch, gum, and so-called extractive matter.

IV. The residual 23.45 grammes were next digested for some days with gentle heat, with water to which a drachm of hydrochloric acid had been added, and the solution was filtered. The contents of the filter weighed 19.70 grammes. From the filtrate oxide of iron and a trace of oxalate of lime were obtained.

V. After having been treated with dilute hydrochloric acid, the author mixed the residuum of 19.70 grammes with water, in which half a drachm of caustic potash had been dissolved. The mixture was digested at a gentle heat for some days, and then thrown upon a filter. The filtrate had a dark brown colour, and gave with hydrochloric acid a deep brown precipitate, which collected, washed, and dried, formed a blackish-brown, resin-like, brittle substance, a little of which, burnt in a tube, afforded among other empyreumatic products, ammonia. This precipitate was obviously nothing else than humic acid, formed by the action of the potash, together with some albuminous matter.

VI. The residue upon the filter, after the treatment with caustic potash, weighed, when well washed and dried, 16.34 grammes. Upon incineration it left 12.5 grammes of a brownish powder, which consisted essentially of ferruginous sand. The 3.84 grammes lost by the combustion represent the organic skeleton of the Kamala.

Analysis of the Ashes.—For this purpose a fresh quantity of Kamala was taken. As already stated at the outset of the paper, the ashes obtained by incineration amounted to 28.85 per cent. of its weight.* The needful preliminary qualitative

* [*Note by Mr. Hanbury.*—Under the supposition that the great discrepancy in the amount of ash obtained by Professor Anderson and Mr. Leube might be due to the latter having used a

examination having proved the presence of silica, lime, iron, manganese, magnesia, alkalies, chlorine, and sulphuric acid, but no trace of phosphoric or carbonic acids, the author proceeded to a quantitative analysis, which afforded the following results :—

Potash and Soda	0.9
Magnesia	0.2
Lime	4.1
Oxide of Manganese	0.7
" Iron	8.5
Silica, soluble	1.2
" insoluble	83.8
Chlorine and Sulphuric Acid	traces
	99.4

This analysis shows the chief constituent of the ashes to be silica, besides which there is a considerable amount of oxide of iron, a little oxide of manganese, lime, and alkalies. The last named would appear to have been chiefly in combination with an organic acid, as only a trace of chlorine or sulphuric acid, and none of phosphoric, could be detected. An ethereal oil of aromatic odour appears to exist, but in quantity so minute that it would require many pounds of Kamala to obtain sufficient for examination. The author thus tabulates the results of his

Examination of 50 *grammes of Kamala.*

23.15	Ethereal extract, of which 22.8 were resin and 0.35 other matter (citric acid and tannin among the organic).
1.39	Alcoholic extract, of which 1.00 were resin and 0.39 other matter (partly tannin).
2.01	Aqueous extract, containing starch, gum, and extractive matter.
3.75	Matter extracted by dilute hydrochloric acid, and containing oxalate of lime and oxide of iron.
3.36	Matter extracted by solution of caustic potash, and containing albumen and (as a product) humic acid.
16.34	Residual matter (*Pflanzenskelett*), consisting of 3.84 fibrous matter and 12.50 inorganic matter.
50.00	

Further Examination of the Resin.—The resin obtained from the ethereal extract was completely soluble in boiling alcohol, but upon cooling, a portion, which was of paler colour, separated from the solution. The resin was therefore treated with cold alcohol, and the difficultly-soluble portion (which formed about a fifth of the mass) collected separately. Both resins are brittle and of a reddish-yellow colour, the easily soluble (α) being somewhat darker in colour than the difficultly-soluble (β). The mixed resins fuse at 100° C.; resin α at 80° and resin β at 191°. Both dissolve in solution of potash in the cold with production of a fine red colour, but upon the addition of an acid, they separate again without apparent alteration. The carbonated alkalies and ammonia also dissolve them, especially when aided by heat. An ethereal solution of resin β, allowed to evaporate gradually in the air, deposited itself round the edge of the vessel as a shining crust, which, examined under the microscope, showed no sign of crystalline structure. From a prolonged digestion with dilute sulphuric acid, it appears that these resins are not (like the resin of jalap) conjugate saccharine compounds, for in the filtered acid solution no reaction of sugar could by any means be obtained. Treated with nitric acid, the resins are decomposed, oxalic acid, among other products, being formed. Incineration showed

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sample of unusual impurity, and that it was possible that Kamala at the bottom of a package should contain more sand than that at the top, owing to the greater sp. gr. of sand, I incinerated three samples (previously dried in a hot air bath), and obtained the following results :—

No. 1. Kamala taken from the *upper* part of an original package, afforded 28.29 per cent. of ash.
" 2. " " *lower* part of ditto..... 27.12 " "
" 3. " " surface of a quantity contained in a jar ... 27.42 " "

them to contain a very minute portion of organic matter, resin α giving 0.6 per cent. and resin β 0.4. The author performed two ultimate analyses of each resin, from which he deduced the following formulæ:—Resin α, C_{30} H_{18} O_8; Resin β, C_{16} H_{12} O_{10}.

The colouring matter of Kamala appears to be very intimately combined with the resin, if not to be it, for from the alkaline solution the resin is, upon the slightest addition of an acid, always deposited with its original colour, while the supernatant liquid, after the precipitation is complete, becomes colourless. Moreover the alcoholic solution of the resin is not in the least decolourized by digestion with animal charcoal.

The author has taken the utmost pains to obtain the body to which Professor Anderson has given the name of *Rottlerine*, but without success. According to Professor A., this substance separates after some days from the ethereal solution in the form of minute plates.* The author allowed an ethereal solution to stand in a closed vessel for several weeks, while another solution was allowed to evaporate gradually in the air. He also tried concentrated solutions and weak solutions, but in no case would anything crystalline separate, or was there a trace of yellow plates perceptible.

The author considers that the active constituent of Kamala is the resin which ether extracts, and that the plan of administering the medicine in the form of tincture is therefore desirable. He adds that the ethereal extract would be likewise an appropriate method of exhibiting the drug, as it is brittle and could be easily administered in the form of powders or pills.

ON THE MANNA OF THE HEBREWS.

BY M. O'RORKE.

All commentators upon the Scriptures have, until now, regarded the substance upon which the Israelites were nourished in the wilderness for forty years, as a true *manna*. From the recent investigations of Dr. O'Rorke it becomes evident that this manna was a kind of Lichen, and, very probably, analogous to a species which he has shown in Paris, which was derived from Algeria.

The following is an abstract of Dr. O'Rorke's communication:—

We read in the 16th chapter of the Book of Exodus, that "The Israelites took their journey from Elim, and came into the wilderness of Sin. God came to the succour of his people. At even the quails came up and covered the camp; and in the morning a thick dew lay round about. *It was a kind of white grain suitable for making bread. It had the taste of the purest flour mixed with milk.* When the children of Israel saw it, they said one to another, *Manhu!* What is this?" From this exclamation arose the word manna.

"It covered the camp at the dawn of day, *and melted at the first rays of the sun. This manna, when pounded, could be formed into a paste, and baked as bread, or made up in several ways in pastry.*"

The Israelites speedily took a dislike to this food, for a little further on (Numbers, chap. xi., v. 6-8) we read again: "But now our soul is dried away; there is nothing at all besides this manna before our eyes, and the manna was as coriander seed, and the colour thereof as the colour of bdellium." The people went about in quest of it, and having gathered it *they ground it in mills, or beat it in a mortar*, and baked it in pans, and made cakes of it, which had the taste of unleavened bread *kneaded with oil.*

Dr. O'Rorke has remarked that, the various translators of the Hebrew text differ amongst themselves as to the taste of the manna. One version of the 31st verse of the 16th chapter of Exodus is thus rendered: This manna was like coriander seed, it was white, and it had a taste resembling *the purest flour mixed with honey.* The translators have evidently confounded the expressions *sweet, little sapid, insipid*, and *sugary*, since they refer the flavour of manna to that of milk, of honey, and even of oil.

Now, in all the European languages the word *manna* is employed to designate a

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* [Professor Anderson says *granular crystals*, which upon purification assume the form of minute satiny plates.—D. H.]

kind of sugary gum,—a concrete sap, which exudes from certain trees in Sicily, Calabria, and Spain,* either spontaneously, or by the puncture of insects, or by artificial incisions. The officinal manna is obtained from species of ash (*Fraxinus Ornus* and *rotundifolia*), and is collected in June and July. The Sicilian manna is purgative, and it is clear that this manna is not that of the Hebrews.

But there are many other kinds of manna known; it is certain even, that this name has been extended to some sugary or resinous substances, and to true honeys. In Europe the larch (*Larix europæa*) yields a concrete juice called *manna of Briançon* or *manna of the larch*. The juniper also, and in Sweden the *Pinus picea*, yield some at the extremities of their highest branches.

The East also furnishes several kinds of manna, derived from different plants, in Syria, Persia, and Arabia. These are obtained from the Cedar, from a leguminous plant (*Hedysarum Alhagi*), from the Oriental oak, (?) from the Tamarisk, and from several other undetermined species of plants.

All these mannas are collected upon the branches and the leaves of the trees which produce them, *or upon the ground beneath the same trees*. They assume the form of little seeds like to coriander, sometimes as white as snow, which the inhabitants collect in June and August before the sun rises; for when the sun has risen, these little masses melt, and form a honey-coloured coating which does not separate spontaneously from the branches. Rauwolf, Gmelin, Niebuhr, and especially Burckardt, have given very correct descriptions of these mannas, and of the plants which produce them.

Burckardt, in the account of his travels in the deserts of Sinai, which were traversed by the Israelites, mentions the *tarfa* or tamarisk as being the plant which furnished the manna of the Hebrews. It is really strange, says he, that this should have remained unknown in Europe until it was indicated by M. Seetzen. This substance is called *mann* by the Arabs, and resembles, up to a certain point, the description of manna given in the Scriptures. It may be remarked further, that this manna is only found in very wet seasons; sometimes it is altogether wanting.

In the season during which the Arabs collect it, *it never acquires that degree of firmness which will allow of its pulverization*. The amount of tamarisk manna really collected, even in the most favourable seasons, is insignificant, and does not exceed five hundred livres for the whole of the country. It is entirely consumed by the Bedouins, who regard it as the most delicate dainty which the country furnishes.

The cedars of Lebanon also yield a manna which resembles that of the larch, called *cedrine*, *mastichina*; in Egypt, the *Asclepias procera* also produces a farinaceous manna, and in Syria the *Apocynum syriacum* is in the same estimation.

But all these mannas, and especially that of the tamarisk, differ very much from the manna of the Israelites. The manna of the Hebrews fell from heaven, and covered the camp on the ground; whilst the real Oriental mannas are obtained from the stems, branches, or leaves of the trees from which they exude, and cannot be dispersed into the atmosphere and then fall in the form of dew. It is true that, anciently, all the mannas were designated by the expressions of *dew of heaven*, *honey of the air*, *heavenly honey*, because the ancients imagined that the sugary drops suspended from the trees were produced by the dew which hardened upon those plants. Such was the opinion of Aristotle, Pliny, and Avicenna. Matthiolus regarded it as a sort of saliva or excrement from certain stars; and it was not till 1543 that all these absurd beliefs were shown to be wrong by Angus Palea, who demonstrated that Sicilian manna did not fall from heaven in the form of dew; he proved that it was produced directly from the proper juice of the ash, by simply covering such trees with a white cloth, and thus isolating them from external influences.

Moreover, the supply of Eastern manna often fails for one or more years in succession; it is always anything but abundant, the trees only producing it for two or three months in the year. The manna of the Bible, on the contrary, fell all the year, and continued to do so for the long period of forty years without intermission.

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* The Spaniards unwisely disregard the collection of the manna which exudes from certain species of ash in their country. This would form a commercial article of some value.

The real manna is only employed as a condiment or dainty—that of the Hebrews served for their daily bread. Moreover, until now, no travellers have related that the Arabs really use manna to replace their bread during meals.

The manna of the Hebrews was not, then, a true manna, and Dr. O'Rorke believes that he can demonstrate evidently that this manna was a *lichen*. The lichens are cryptogamous, and there are a great many species. They are the first plants which make their appearance upon naked bodies, such as stones, rocks, and the ground. These plants have no true roots, and are not parasitic, except in appearance, for they do not live at the expense of the body upon which they are applied and to which they adhere. Heat dries them up, but moisture restores them to life.

No lichen is deleterious, and all contain a nitrogenous matter, and in abundance a kind of starch ; they are employed, therefore, in several parts of the globe as food for man and other animals. We could even employ them everywhere for such a purpose, did we not possess more nourishing matters, and of more agreeable flavour. In Lapland the reindeer eat them ; in Norway, those of the inhabitants which are nourished by them are said to be less frequently affected by leprosy than those of whom fish constitutes the principal food. The alimentary value of certain lichens would be even superior, according to some authors, to that of wheat, since a bushel of powdered lichen is equivalent to two bushels of wheat-flour. A great many lichens contain enormous quantities of oxalate of lime. Some contain a bitter principle (*cetrarine*, &c.); which renders them febrifugal; others a rich colouring principle (*orcine*) ; and all contain a fecula analogous to *inuline*, which is not coloured blue by iodine.

Amongst the lichens, there is one which is called by Pallas *Lichen esculentus*, and which, according to Acharius, belongs to the genera *lecanora* and (?) *parmelia*. This lichen is found in Persia, in the deserts of Tartary, in the Crimea, in Asia Minor, &c., *always on the ground*, where it is carried either by the winds or by its falling from the neighbouring mountains. It there sometimes forms beds several inches in thickness. The sheep are nourished by it, and men make of it a kind of bread, which the poor consume and regard as a true manna sent to them by Providence.

Already, on the 3rd of August, 1828, Thénard had presented to the Academy of Sciences a lichen of a fawn colour, granulated, composed of broken crusts, which had fallen in the neighbourhood of Mount Ararat, in Armenia, and which a Russian general of the Persian army had sent to him.

It appears that this lichen dries up during the summer upon the mountains, and is transported by the winds to a great distance, which has caused the inhabitants to say that, *this grain fell from heaven*. This shower was not rare, and under certain circumstances covered the ground to a depth of five or six inches in several places. The sheep were very fond of it, and men were habitually nourished by it.

A shower of this kind was noticed in 1845 in the Crimea, at Jenis-Bechir. It covered the ground to a depth of three or four inches, and the inhabitants, following the example of Dr. Leveillé, nourished themselves with it for several days.

This lichen is even more common in the Algerian Sahara, and in Arabia. Everywhere they employ it for the nourishment of men and horses.

The specimen lately shown in Paris by Dr. O'Rorke was collected by M. Bellesterot at Boghar, in Algeria, and M. Hardy, Director of the Botanic Gardens of Algiers in 1849, had sent a specimen of it to the Exposition, which was altogether unnoticed.

This lichen, called *takaout* in Arabia, and *ousseh elard* (excrement of the earth) in Algeria, is found in the form of little twisted rounded grains, the largest of the size of a pea, and of a yellowish-grey earthy colour. Its fractured surface is white and farinaceous, and contains some particles of sand which crack under the teeth. In flavour it is insipid, amylaceous, and with a feeble aroma of the champignon. When boiled in water this lichen slightly swells, becomes more tender, and can be mixed with milk, butter, and salt, and form a food which has no bad quality or disagreeable appearance.

In the Algerian Sahara, as well as in Arabia, this lichen does not adhere to any foreign body; *it appears to spring spontaneously from the ground after rain ;* the wind collects it together in certain places in large heaps, and they say of it *acquirit vires*

eundo, for in its wandering course it vegetates, and increases in size. Its surface is covered with small, very apparent fructifications, from which, at maturity, the reproductive sporidia escape, which, microscopic in appearance, become dispersed over the ground, or are transported by the winds to enormous distances, in order to develop themselves, when the conditions of soil and humidity are favourable to them. Such, while it remains, is of an inestimable value to the wandering and migratory tribes of the deserts, who are preserved by it from hunger in years of famine and in certain particularly critical circumstances.

Is it not evident, says Dr. O'Rorke, that this substance is the true manna of the Hebrews,—that which fed them with regularity for forty years in the wilderness? Those who desire a more complete agreement with the text of the Scriptures can yet admit this conclusion:—Moses has confounded, under the name of manna, two distinct substances, because they both resembled each other in apparently falling from heaven, that is—

1st. An amylaceous substance which could be preserved and pulverized, suitable for making bread, might be collected at any time, increasing on the ground, like to coriander or bdellium in colour: this is the lichen described above.*

2nd. A sugary substance, very readily alterable, somewhat rare, and collected on certain trees or shrubs during three months of the year only, and serving as a condiment or dainty to mix with the lichen bread: that is to say, the *manna of the tamarisk*, of the *Alhagi*, and perhaps of some others.

We see then, that the real bread of the Hebrews, *the manna of the wilderness*, is no other than the *Lichen esculentus* of Pallas, or the *Lecanora esculenta* of Acharius. No commentator has hitherto alluded to this.—*Journal de Pharmacie et de Chimie*, June, 1860.

ON THE PRODUCTION OF BALSAM OF PERU.

BY DR. CHARLES DORAT.

Extract of a Letter from Dr. Dorat, of La Union, State of Salvador, Central America, to Dr. J. Carson, Professor of Materia Medica in the University of Pennsylvania.

Dear Sir,—The difficulty attending a visit to the interior of the Balsam coast, and the extreme jealousy of the Indians towards all strangers seeking any kind of information concerning the products of their reserved lands, have prevented me, until the present time, from complying with your expressed desire to obtain specimens of the Balsam and Cinchona trees of this region. The *flowering season* of the former, in particular, being of very short duration, of scarcely more than a few days, it requires a residence of some time previous in the vicinity, to obtain the specimens. This year I succeeded, and am therefore enabled to send you the results, viz. a dried specimen and a coloured drawing, made on the spot. It is of natural size, and intended for my journal, perfectly correct, although not highly finished. I also subjoin an extract from the same, including a few observations on the location of these trees, and on the mode of extracting the balsam.

These trees were formerly found in great numbers, covering the great inclined plain of Acajutla, as far west as the range of mountains on the frontier of Guatemala, but at present, with very few solitary exceptions, are confined to the nearly uninhabited portion of the Pacific coast, between the new port of Acajutla and La Libertad. The medicinal virtues of the balsam were well known to the Indians before the conquest, and packed in earthenware jars, ornamented with the head of *Pajuil* or wild turkey, formed part of the tribute annually paid to the great chiefs of Cuscatlan, the present San Salvador. Its repute in the healing of wounds continued during and after the conquest, increasing with the scarcity of the balsam, from the wasteful destruction of the trees on the plain, then occupied by the Spaniards, who cut down the trees and boiled the chips. This custom was afterwards prohibited.

* Dr. O'Rorke has since seen another sample of this manna of the desert in a collection of materia medica from Arabia. These specimens, of different production, possess precisely the same physical characters. According to M. Guibourt, the *Lichen esculentus* of Pallas, collected in the Crimea in 1845, differs slightly from the *Lecanora* of Arabia; and also, according to M. Guibourt, the analysis of a shower of lichen which fell in Persia (*Parmelia esculenta*), made by M. Goebel de Dorpat, indicated 65.91 per cent. of oxalate of lime.

According to a manuscript copy of a papal bull, at present among the old records in Tzalco, Balsamo Negro was in such high estimation, that in 1562 Pio IV., and in 1571 Pio V., issued orders authorizing the clergy to use this precious balsam in the consecration of the "*Sagrada Crisma*," and pronounced it sacrilege to destroy or injure the trees producing it. Copies of these bulls are, I am informed, still in existence among the archives of Guatemala.

The tree is handsome, rather widely branching below, diminishing at top, and about 50 feet high. The flowers, which are very odoriferous, appear in the latter part of September and beginning of October, at the extremities of the branches, generally in pairs, numerous on each stem, white and unequal; calyx of a pale bluish green, and very glutinous, from exuding balsam. Leaves of a dark shining green. The fruit is almond-shaped, winged, and containing a white kernel, with much balsam.

A very superior balsam is sometimes collected from the flowers, but is very scarce, and never found in commerce. The tree produces after five years' growth, and attains a great age. It prefers a dry and poor soil, but is never found above an altitude of 1000 feet. The aroma is perceived at a distance of more than 100 yards. The tree having attained the proper age, five or six years, the *coseche*, or collecting, begins with the dry season early in November. The bark, for some distance up, is well beaten on four sides with the back of an axe, or other blunt instrument, until it has separated from the woody part, but without injury or breaking. This requires great care. In performing this operation, four intermediate strips of bark are left untouched, so as not to destroy the vitality of the tree.

Several notches or cuts are now made in the portions of beaten bark with a sharp *machite*, and fire is applied to the openings. The exuding balsam kindles and is allowed to burn for a certain time, and then extinguished.

The tree in this state is left for 15 days, and carefully watched; after which time the balsam, which begins to run copiously, is received on cotton rags stuffed into the cuts. When saturated, they are pressed and thrown into the earthenware pots, with boiling water, on which the balsam soon floats like oil. It is occasionally skimmed off and thrown into clean jars, while fresh rags are added. The extraction from the tree is only made during four days of each week, that is, four coseches per month for each tree, and the average produce is from 3 to 5 pounds per week. As soon as the supply begins to fail, fresh cuts are made in the bark, fire again applied, and after the 15 days' rest, the extraction is resumed. In this manner the collecting continues until the first rains appear in April or May, when all *trabajo* or work ceases.

When thus prepared, the balsam is of a very dark brown colour, dirty, and of the consistence of turpentine. It is cleared and cleaned on the spot, by settling and re-boiling, when the impure parts rise to the surface and are skimmed off. This impure part is sold for manufacturing an inferior tincture, used medicinally among the Indians.

The balsam in this state is purchased on the coast, at an average of from 3 to 4 *reals* per pound. It sometimes undergoes a second clearing, when it fetches a higher price as "refinado." When first cleaned it is of an amber colour, which darkens on cooling; finally, after a few weeks, it becomes dark brown.

A good tree, with careful usage, will produce well for 30 years, after which it is allowed to remain 5 or 6 years at rest, or as the Indians say, to renew its strength. After this period it will again yield for several years.

The wood is very elastic, hard, close-grained, and of a dark reddish-brown and yellow colour. It takes a good polish.

It has been asserted that there are two or three varieties of balsam trees on this coast; as far as the knowledge of the Indians and my own researches extend, such is not the case. Only the one species exists, the *Balsamo negro;* neither is the *Balsamo blanco* found here, although the produce of the "*Cortés blanco*" may have been sold under that name. This produce is as highly esteemed throughout the country for its curative properties as the *Balsamo negro*, but the *tree*, *flower*, and *fruit* are entirely different. The balsamito is an alcoholic extract from the fresh and young seeds, when broken, and is really a valuable medicine, in use here as a tonic and stimulant.

An Aguardiente de Balsamo, made from the flowers, is sometimes prepared on the principal haciendas. It resembles a liqueur, and is very scarce and expensive.

The Indian Pueblos on the coast, that supply the market of Sonsonate with *Balsamo negro*, are—Juisnagua, six leagues from Tzalco; Tintepeque, Ticalapa, Chiltiapa, Falmique, Famanique and Cumasagua, near La Libertad. These pueblos are about three leagues' distance from each other, situated among dense forests of the finest woods, and not to be reached but with a willing Indian guide.

The first and the last of the above-named pueblos, being in the vicinity of the two ports of Acajutla and La Libertad, produce very little balsam; they are merely depôts, the inhabitants purchasing the article from the interior, themselves holding contracts with the merchants of Sonsonate.

The medicinal properties of this tree are too well known to need a description. I may only remark, that the Indian *Curanderas* use both the bark and leaves for preparing stimulating drinks to be used after severe cases of the coast fever.

I have also the pleasure of forwarding you a drawing of an old balsam pot, from an Indian mound, on the coast near Juisnagua. The bird's head so curiously represented is that of the *Pajuil*, or Mexican pheasant, regarded by most of our neighbours here as the wild turkey. The Pajuil and other birds are found in numbers on the balsam trees, feeding on the young and tender seeds. The wild hogs are also fond of them.—*American Journal of Pharmacy*, July, 1860.

La Union, March 10*th*, 1860.

ON THE ADVANTAGES OF THE STUDY OF BOTANY TO THE STUDENT OF MEDICINE.

BY PROFESSOR BENTLEY, M.R.C.S.E., &c.

THE following remarks, although addressed especially to the Medical Student, have a direct bearing upon the study of Botany as a branch of the education of a Pharmaceutical Chemist:—

Natural History, as a science, has for its object the investigation of everything that relates to the bodies placed on the surface of the globe, or combined so as to form its substance. These, by the common observer, as well as by the man of science, are arranged in three divisions, which are called respectively, the Animal, Vegetable, and Mineral Kingdoms. The bodies comprised in the two former being possessed of life, form the Organic or Animate Creation; while those of the latter not being endowed with life, constitute the Inorganic or Inanimate Creation. Botany is that science which has for its object the investigation of the lower ranks of the Organic Creation called Plants or Vegetables: it takes cognizance of everything which relates to them either in a living or fossil state; it investigates their nature; their internal organization; their external configuration; the laws by which they are enabled to grow and propagate themselves; and their relations to one another and to the bodies by which they are surrounded.

A science embracing so wide a field, and as you will afterwards find of constant application in the practice and pursuit of your profession, and which has, from the earliest periods of which we have any record, occupied a prominent position in the medical curriculum, cannot but be of importance for you to acquire at least some knowledge of, although I know that by many it is considered of but little value, and by some even, as absolutely useless. Let us, however, briefly review the advantages to be derived from the study of Botany by the student of Medicine, and then we shall be better able to judge, whether its study be so unimportant and useless as some would have us believe. In doing so, we will divide our subject into three parts. In the first place, we will treat of its advantages as bearing directly upon your professional studies: secondly, of its importance indirectly, as a training to the mind: and thirdly, as a recreation.

In the first place, therefore, we have to consider the advantages to be derived from the study of Botany in its direct bearings upon your professional studies. At the present time, there are between three and four hundred species of plants, some parts of which, or substances produced by, are more or less used by the medical practitioner as remedial agents, and the greater part of which enter into the

recognised formularies of our Colleges, and will come, therefore, under your particular notice in the course of your studies. Can it be an unimportant matter for you to become acquainted with such species, so far at least as to be able to recognise them, to describe their structure, to know their positions in the Vegetable Kingdom, and the general properties which they possess? Would it not be lowering the dignity of the medical profession beneath that of the meanest trade, if we, as members of it, were in the habit of making use of substances in our hourly practice, when we were at the same time ignorant of everything that was most essential in their history? Such a knowledge of facts, therefore, cannot but be considered as of the greatest value to the student of Medicine when called upon hereafter to practise his profession, either in his own or in any civilized country.

Even if we only regard the different medicinal plants, which are found wild in this country, a knowledge of Botany ought by no means to be despised; for it should be remembered that, many important articles of the Materia Medica are obtained from them, such, for instance, as *Atropa Belladonna*, *Hyoscyamus niger*, *Datura Stramonium*, *Solanum Dulcamara*, *Digitalis purpurea*, *Conium maculatum*, *Colchicum autumnale*, *Daphne Mezereum*, *Linum usitatissimum*, *Mentha piperita*, *Mentha viridis*, *Mentha Pulegium*, *Valeriana officinalis*, and many others. It is Botany that gives us the knowledge required to recognise these species, and to distinguish them from other plants with which they may be intentionally or ignorantly mixed; and also to acquaint us at what times plants or portions of plants should be collected, in order to obtain the full amount of their active medicinal properties. A knowledge again, of the general properties of the various natural orders of plants, will also give us a clue in the search for new remedies, for it is highly probable that in a country like our own, which, as just mentioned, yields so many important plants, may also contain others not yet known; and even should this not be the case, it will at all events direct our attention more especially to the properties of some of our native plants, which are but too little appreciated at the present day, so that in the event of war, or any other cause arising which might produce a deficiency or withdrawal of any of our important medicinal substances derived from abroad, we might look at home for substitutes. There are, without doubt, many indigenous plants not at present officinal in our Pharmacopœias, or but very rarely employed in this country, which would then come into demand.

Thus, to take as an illustration the natural order Gentianaceæ. All the plants of this order are more or less bitter, and possess tonic properties, and many of our native plants belonging to it might therefore be used, if necessary, for the officinal gentian root obtained from abroad; thus, the *Gentiana Amarella* and *Gentiana campestris*, *Chlora perfoliata*, *Erythræa Centaurium*, *Menyanthes trifoliata*, and others, might be so employed; indeed, the two latter plants are still included in the Edinburgh Pharmacopœia, but they are now but very rarely used, not because they do not possess well-marked tonic properties, but because they have, rightly or wrongly, been superseded by drugs derived from plants of foreign growth.

Then, again, to refer to indigenous plants which possess astringent properties, such as the *Potentilla Tormentilla*, *Polygonum Bistorta*, and *Rumex aquaticum*. The Tormentilla especially, is a powerful astringent, but now scarcely ever employed, although, as Dr. Christison says, it is no doubt "equally applicable with catechu, kino, and other astringents of foreign origin in the treatment of chronic dysentery, and other chronic mucous discharges."

Then, again, to refer to the *Acorus Calamus*, a plant which is abundant in the marshes and by the sides of rivulets in some parts of this country. Many pharmacologists have borne testimony to the value of this plant in medicine, as a stimulant excitant, mild aromatic tonic, and for the cure of intermittent fevers, but it is now rarely or ever used, though as stated by Dr. Pereira, "it might be frequently substituted, with good effect, for the more costly Oriental aromatics." The *Helleborus fœtidus* and the *Helleborus viridis*, also of our own country, are equally efficacious, if not more so, as drastic cathartics, with the officinal and foreign *Helleborus niger*. The *Lastræa* or *Nephrodium Filix-mas*, again, another very common wild plant, has been employed for ages as an anthelmintic, but its properties were almost forgotten

till lately, when the introduction of Kousso, a substance possessing similar properties, from abroad, again brought it into notice.

Again, the *Arum maculatum* of our hedges would yield us, if required, abundance of starch, which might be employed as a substitute for sago and the various kinds of arrowroot derived from abroad. Again, from the bark of various species of *Salix* and *Populus* we can obtain a peculiar alkaloid, called *salicine*, which has been found to possess well-marked tonic, and to some extent, anti-periodic properties, and which might, therefore, become most valuable, should there be any failure in the supply of the barks yielding Quinine and Cinchonine. The above are but a few of our indigenous plants which possess well-marked medicinal properties, but they will be sufficient to show the great advantage that the student of Medicine will derive from a knowledge of Botany, when called upon hereafter to practise his profession in his own country.

But if a knowledge of Botany be so valuable in its results to the medical practitioner in this country, it will become vastly more important to him, if (as constantly happens in a nation like our own, with numerous colonial possessions in all parts of the world), he may be required to practise his profession in an almost unknown district. Then, a knowledge of Botany will give him a clue to the properties of the plants he will see around him, for its study will have taught him that those which resemble each other in their structure—that is, those belonging to the same natural order—may be expected to resemble one another in their properties. He will know, also, that whilst certain tribes of plants are almost universally poisonous, or to be regarded with suspicion; others, on the contrary, are at least harmless; while others, again, may be expected to possess some important properties, applicable as a medicine, or as yielding some product of value for manufacturing purposes, or in the Arts, or Domestic Economy.

Thus, to take a few illustrations, a knowledge of Systematic Botany will have taught him that, all plants of the natural orders—Cruciferæ, Malvaceæ, Labiatæ, Cactaceæ, Palmaceæ, Graminaceæ, and many others—are generally harmless, as these orders scarcely contain any well-marked poisonous species; while he will have learned, at the same time, that the plants of the orders Ranunculaceæ, Papaveraceæ, Loganiaceæ, Solanaceæ, Euphorbiaceæ, Melanthaceæ, and others, are to be regarded with suspicion, as most of them are, more or less, of a poisonous nature. Then, again, do we wish to know the medicinal properties of plants, or to search for new remedies, we have an important guide in a knowledge of Botany. Thus, the Papaveraceæ yield a milky juice, which frequently presents well-marked narcotic properties; the Cruciferæ are antiscorbutic and stimulant; the Malvaceæ are emollient; the Guttiferæ, acrid and purgative; the Simarubaceæ, bitter and tonic; the Rubiaceæ, tonic, febrifuge, and astringent; the Solanaceæ, narcotic; the Gentianaceæ, tonic; the Lauraceæ, stimulant, tonic, and bitter; the Piperaceæ, acrid, pungent, and stimulant; the Coniferæ yield turpentine, pitch, and resinous substances; and the Zingiberaceæ are aromatic and stimulant. These examples are but a few out of many which I might have brought forward as illustrations, but they will be sufficient for my present purpose. It is right, however, that I should tell you, that a corresponding structure in plants is not always to be depended upon for ascertaining their medicinal properties, for it does occasionally happen, that although plants are allied in structure, they differ in their medicinal and other properties. Thus, the powerful *elaterium* plant is in the same order with the *melon* and *cucumber;* the poisonous *hemlock* with the edible and nutritious *parsnip* and *carrot;* the *belladonna* and *henbane* with the *capsicum;* and other examples of an analogous kind might be quoted if time allowed. In reference to these exceptions, it should be remembered, however, that no properly educated botanist would pretend to say that any one of our Natural Systems is altogether perfect, for such cannot be the case until we have a much greater knowledge of plants than we can as yet boast of; but, at the same time, all searchers after truth must admit, from the examples quoted above of the medicinal properties of many orders, that a knowledge of them, even as at present defined, is of most essential service in guiding us to an acquaintance with the properties of plants; and I think, therefore, that we may justly conclude that, the apparent exceptions which we occasionally find in the properties of certain plants to those now placed by us in the same natural order, are due to some differences in structure, which, in our present

imperfect knowledge, we have overlooked, or regarded as unimportant (for who can yet say how trifling a difference apparently in such respects may lead to important changes in their properties?). Such exceptions, therefore, should not have the effect of inducing us to lay aside the search after a Natural System as useless, but they should rather act as a stimulus for further investigation; for, to use the words of Linnæus, the formation of a true natural system cannot but be regarded, as the "primum et ultimum in botanicis desideratum."

We see, therefore, that by a knowledge of Botany, a medical practitioner would, in case of need, or in a deficiency of supply in the medicines he was in the habit of employing, possess a clue to the resources by which he was surrounded, and would accordingly frequently find himself almost as much at home in an unknown country as in his own native land; for such a knowledge would enable him to search for new remedies, when he would be almost certain to find something of value, not only for his own use, but for that of the world at large. He might even be the instrument of discovering a most important remedial agent, which, by the blessings it would confer upon mankind, would be the means of handing down his name and memory to posterity as one of the great benefactors of the human race.

What pleasure could excel, or even equal, that of such a man? who would be thus enabled, and when least expected by those by whom he was surrounded, to alleviate their sufferings and minister to their wants; and what distress of mind would be the lot of him who, when placed in similar circumstances, would be unable to avail himself of the means which a bountiful Providence had placed at his disposal, because he had omitted to make himself acquainted with an important branch of his education. In this respect alone, therefore, a knowledge of Botany cannot but be considered as of the most essential service to the medical practitioner, whether pursuing his profession in this or any other part of the world.—*Extract from Inaugural Address, King's College, London.*

MISCELLANEOUS OBSERVATIONS.

BY DR. HOFMANN.

Spontaneous Decomposition of Chloride of Lime.—One morning (I think it was in the summer of 1858), when entering my laboratory, which I had left in perfect order on the previous evening, I was surprised to find the room in the greatest confusion. Broken bottles and fragments of apparatus lay about, several window-panes were smashed, and all the tables and shelves were covered with a dense layer of white dust. The latter was soon found to be chloride of lime, and furnished without difficulty the explanation of this strange appearance.

At the conclusion of the Great Exhibition of 1851, M. Kuhlmann, of Lille, had made me a present of the splendid collection of chemical preparations which he had contributed. The beautiful large bottles were for a long time kept as a collection; gradually, however, their contents proved too great a temptation, and in the course of time all the substances had been consumed. Only one large bottle, of about 10 litres capacity, and filled with chloride of lime, had resisted all attacks; the stopper had stuck so fast that nobody could get it out; and after many unsuccessful efforts —no one venturing to indulge in strong measures with the handsomé vessel—the bottle had at last found a place on one of the highest shelves of the laboratory, where for years it had remained lost in dust and oblivion, until it had forced itself back on our recollection by so energetic an appeal. The explosion had been so violent that the neck of the bottle was projected into the area, where it was found with the stopper still firmly cemented into it.

I have not been able to learn whether similar cases of the spontaneous decomposition of chloride of lime have been already observed.

Spontaneous Decomposition of Gun-cotton.—Some gun-cotton prepared in the establishment of Messrs. Hall, soon after Schönbein's discovery, and taken out of a cartridge intended for blasting, had been preserved by my friend Dr. Percy since 1847, in a glass bottle provided with a glass stopper. After some time, red vapours had appeared in the interior of the bottle, and the cotton had crumbled down to a loose powder. When lately the bottle was again examined, the powder was found

to be converted into a light brown, semi-fluid, gum-like mass, while the side of the bottle had become coated with a network of fine needles. It was not difficult to collect a sufficient quantity of these crystals; they exhibited all the characters of oxalic acid. In order to fix their nature by a number, they were converted, first into the ammonium-salt, and then into the silver-salt.

0.2420 grm. of silver-salt gave 0.2275 grm. of chloride of silver = 70.74 p.c. of silver.

Oxalate of silver contains 71.05 p.c. of silver.

The viscid mass into which the bulk of the gun-cotton had been converted, exhibited all the properties of ordinary gum; it was likewise interspersed with crystals of oxalic acid.

On Glycerin.—Before the nature of this interesting compound had been finally established by Berthelot's remarkable inquiries, it had been frequently surmised that the saponification of the several fatty bodies which are found in nature did not invariably furnish the same kind of glycerin.

This view appeared to receive new support in the researches of Wurtz, who has rendered it probable that glycerin is but the type of a class of homologous triatomic alcohols.

As a contribution towards the elucidation of this question, an experiment may be briefly mentioned which arose from a conversation with my friend Mr. George Ferguson Wilson, the technical director of the great establishment well known as Price's Patent Candle Company. Many hundred weights of glycerin are weekly separated in these works, by single steam-saponification, from a considerable variety of fatty bodies; and Mr. Wilson, who has studied with predilection the preparation and purification of glycerin on a large scale, has acquired a sum of practical information upon this subject such as will not easily be found again. To my question, whether there is more than one kind of glycerin, Mr. Wilson replied, that in his opinion all the fatty bodies which he had examined contained the same variety of glycerin, with the exception of cocoa-nut oil, the glycerin-like constituent of which differed in many respects so much from ordinary glycerin, that he was inclined to consider it as a special variety.

Since this question admitted of a simple experimental solution, Mr. Wilson kindly supplied me with a quantity of glycerin obtained by the saponification of cocoa-nut oil. This substance, although prepared in the same manner, differed in colour and odour from the glycerin furnished by other fatty substances. But notwithstanding the colouring matter, and an odorous principle which adhered with great pertinacity, it was not difficult to identify the compound under examination with ordinary glycerin. Distilled with iodide of phosphorus it furnished iodide of allyl, which exhibited the same boiling point as that obtained from ordinary glycerin, and was also transformed under the successive influence of oxalate of silver and ammonia, respectively, into oxalate of allyl and allyl-alcohol.

These experiments appear to solve the question as far as cocoa-nut oil is concerned.

Remarks on the Changes of Gutta Percha under Tropical Influences. * —The peculiar change which gutta percha undergoes when in contact with air for some time is well known, this substance gradually becoming brittle, and ultimately losing all coherence. This effect was experienced on an undesirable scale in constructing the East Indian Telegraphs. Enormous quantities of gutta percha became in a comparatively short time entirely useless, involving a loss of thousands of pounds. At the request of Sir W. B. O'Shaughnessy I have made a few experiments with the gutta percha thus altered, the results of which were recalled to my mind by the researches on the alteration of gutta percha lately published by Oudeman. It may be of some interest briefly to mention the analytical results furnished by the changed material submitted to me for examination.

The specimens sent home from India formed a brown, exceedingly brittle substance, softening to a plastic mass in boiling water. Since the gutta percha existing in

* From a Report addressed to Sir W. B. O'Shaughnessy, Director-General of Telegraphs in India.

commerce does not always exhibit the same characters, it was of some importance for the inquiry that a quantity of the original unchanged substance, with which the wires sent out to India had been coated, was likewise placed at my disposal. In their deportment with solvents the changed and unchanged gutta percha exhibited a marked difference. Whilst the latter proved to be perfectly insoluble in strong alcohol, the changed gutta percha was in a great measure taken up by this solvent. By treating the changed material first with cold, then with boiling alcohol, and ultimately with ether, three substances were obtained, which, although very much alike in their physical properties, differed considerably from each other in their chemical composition.

I.—*Substance soluble in cold Alcohol.*—Cold alcohol readily attacked the outer surface of the coating, and dissolved a considerable portion. On evaporation a brown resinous mass remained behind, which was dried, first over sulphuric acid and ultimately at 100°; at which temperature it readily fused. The fused mass solidified on cooling to a brittle substance, yielding a highly electrical powder, and exhibiting on combustion the following per-centage composition.:—

	I.		II.		Mean.
Carbon	62.94	...	62.64	...	62.79
Hydrogen	9.22	...	9.36	...	9.29
Oxygen	27.84	...	28.00	...	27.92
	100.00		100.00		100.00

II.—*Substance soluble in boiling Alcohol.*—By treating with boiling alcohol the residue of the previous operation, which had ceased to yield anything more to cold alcohol, a fresh quantity of substance was obtained in solution. The alcoholic liquid, on evaporation, left a residue very similar to that of the previous operation, which when dried in the same manner, furnished on analysis the following numbers:—

	I.		II.		Mean.
Carbon	68.13	...	67.29	...	67.72
Hydrogen	10.01	...	10.18	...	10.09
Oxygen	21.86	...	22.53	...	22.19
	100.00		100.00		100.00

III.—*Substance insoluble in cold and in boiling Alcohol.*—The residue left after repeated treatment with boiling alcohol, dissolved in ether, a few mechanical impurities remaining behind. The ethereal solution gave with alcohol a precipitate which dried up to a yellowish powder, becoming highly electrical by trituration, and caking when gently heated. It had the general characters of gutta percha, being merely somewhat deeper coloured and less plastic. When analyzed, it furnished numbers nearly agreeing with those which were obtained by several observers for gutta percha:—

Carbon	88.12
Hydrogen	12.49

The body last analyzed was obviously unchanged gutta percha; a view which is also supported by its solubility in chloroform and benzol. The substance in question differed from specimens of gutta percha investigated by others, and especially from that which Payen considers the pure gutta percha, by its solubility in ether. The original substance with which the wires had been coated was, however, likewise soluble in ether. It cannot, therefore, be doubted that percha exists in several modifications.

The experiments which I have quoted prove that the changes which gutta percha undergoes in contact with air depend upon oxidation. Unchanged gutta percha is free from oxygen ; the product dissolved by cold alcohol contained nearly 28 per cent., and that soluble in boiling alcohol still more than 22 per cent. of oxygen.

I need not mention that I am far from believing that these oxygenated substances are definite chemical compounds. Their mode of preparation altogether precludes such an idea, the object of the experiments having been simply to establish the fact

of oxidation having taken place. That the changes of gutta percha are due to the absorption of oxygen, is countenanced by the experience of this substance having been kept for years under water without undergoing any alteration.—*Quarterly Journal of the Chemical Society.*

SPECIAL HOSPITALS.

We, the undersigned, are of opinion that much detriment to the public and to the Medical Profession arises from the modern practice of opening small institutions, under the name of hospitals, for particular forms of disease, in the treatment of which no other management, appliance, or attention is required, than is already supplied in the existing general hospitals.

The practice is injurious, first, because in the maintenance of numerous small establishments the funds designed for the direct relief of the sick poor, are wasted in the useless multiplication of expensive buildings, salaries, and hospital appliances, and in the custom of constantly advertising to attract public attention.

Secondly, because the public is led to believe that particular classes of disease can be more successfully treated in the small special institutions than in the general hospitals, an assumption directly contrary to evidence; the fact being that the resources of the general hospitals are in every respect superior to those of the special institutions alluded to.

Thirdly, because it is essential for the interests of the public, with a view to the efficient education of students preparing themselves for the practice of the medical profession, that all forms of disease should, as far as possible, be collected in the general hospitals to which medical schools are attached.

As an example that the evil referred to is increasing, we regret to observe that an attempt is being made to set on foot a special hospital for the treatment of stone and diseases of the urinary organs. We desire to express our opinion that such an institution is especially unnecessary; the existing general hospitals provide ample accommodation for the treatment of all these maladies; *no case is ever refused admission into them;* there are no diseases which receive more care, attention, and skilful management; and there are no men in this or any other country who have greater experience in treating them than the surgeons of our general hospitals.

Signed by Sir Benjamin C. Brodie, Bart., President of the Royal Society; Joseph H. Green, F.R.S., President of the Medical Council; Thos. Mayo, M.D., F.R.S., President of the Royal College of Physicians; J. F. South, President of the Royal College of Surgeons; James Moncrieff Arnott, F.R.S., Late President of the Royal College of Surgeons; Sir Charles Locock, Bart., Physician Accoucheur to the Queen; P. M. Latham, M.D., Physician Extraordinary to the Queen; Thomas Watson, M.D., F.R.S., Physician Extraordinary to the Queen; W. Gibson, M.D., C.B., Director General of the Army Medical Department; Sir John Liddell, C.B., F.R.S., M.D., Director General of the Navy Medical Department; Sir J. Ranald Martin, C.B., F.R.S., Physician to the Council of India; B. G. Babington, M.D., F.R.S., President of the Epidemiological Society; Sir Charles Hastings, M.D., President of the British Medical Association; J. H. James, Esq., F.R.C.S., Consulting Surgeon to the Devon and Exeter Hospital; J. A. Symonds, M.D., Consulting Physician to the Bristol General Hospital; and many others.

The following letter accompanied Sir Benjamin Brodie's signature.

Broome Park, Betchworth, Surrey, July 16th.

Dear Sirs,—Agreeing in the views expressed in the paper which you have sent me, I am happy to add my signature to it.

An exception, indeed, may be made, on grounds which meet with the general concurrence of the profession and the public, in regard to ophthalmic infirmaries. Otherwise it seems to me that there are very great objections to the establishment of special hospitals for the treatment of particular diseases.

First.—Diseases are generally so connected with each other, and a knowledge of one is so necessary to the right understanding of another, that no one who limits his attention to any given disease, can be so competent to investigate its nature, and to improve the method of treating it, as those who have a wider field of observation, and who are better acquainted with general pathology.

Secondly.—The effect of establishing special hospitals and infirmaries is to abstract particular classes of disease from the general hospitals, and thus to prevent the students of those hospitals from having the opportunity of studying certain branches of their profession, an acquaintance with which is necessary to make them useful practitioners afterwards.

Thirdly.—The system of establishing special hospitals, which now prevails, is a source of much unnecessary expense to the public; each one of these, however humble it may be, requiring a separate house, and a separate establishment of matron, nurses, and servants. At least two-thirds of the expense thus incurred would be saved, if the patients who are there admitted were sent to the existing general hospitals instead; and it cannot be said that in these last there is no room for their reception, there being several which are languishing for want of funds, with their wards empty because the means of supporting them have been drawn away to other institutions.

I am, dear Sirs, yours truly,
BENJAMIN C. BRODIE.

To the Members of the Deputation appointed by the Representatives of the Medical Staffs of General Hospitals.

[As bearing upon the foregoing subject, we reprint the following judicious remarks from the pages of a contemporary journal:—]

HOSPITAL DISTRESS.

THE foreigner who looks into the advertising pages of the *Times* cannot fail to be struck with the apparently bankrupt condition of our London hospitals. Day by day a column and a half of most urgent advertisements assure the public that, unless immediate aid is given, half their wards must be shut up. Side by side with these begging appeals are to be found others, equally pathetic, imploring aid for the completion of hospitals, the necessity for which is more than doubtful. In one instance, indeed, the glaring contradiction involved in these two appeals is monopolized by one institution—St. George's Hospital. Last year an extra story was added to this building; to-day an advertisement appears in the columns of the *Times*, stating that "if the public do not, by increased subscriptions and donations, enable the governors to meet the deficiency (of income with respect to expenditure) they will be compelled to close several of the wards." Can the force of audacious coolness further go? But let us ask, in sober calmness, what is the cause of the growth of "charitable" bricks and mortar, and what is its tendency? To read the carefully-worded advertisements, it would appear that hospitals, in the metropolis at least, were erected solely on the behalf of suffering humanity, and that the more we build the better for society. Any one who knows anything of the working of our metropolitan charitable institutions is fully aware how far this is from the real —and, we must add, in too many cases, the vulgar—truth. It is noticeable that most of our new hospitals are dedicated to the treatment of special diseases; and it is further observable that most of these have originated in the energetic action of some individual. The germ of such buildings is the dispensary. An energetic surgeon makes up his mind to step to fame and fortune by means of bricks and mortar. But, first of all, he must hit upon some striking speciality—the "Dispensary for the Treatment of Inverted Eyelashes," for instance. A quiet house is taken in a side street, patrons and patronesses are canvassed for, and in an incredibly short space of time a goodly sprinkling of the aristocracy have been found to pledge themselves to serve suffering humanity and Mr. Ectropium in the matter of inverted eyelashes. There is an annual list of subscribers, and the accounts are of course audited; but possibly a more searching inquiry than *dilettante* auditors are likely to give would prove that Mr. E., in his account with poor humanity, has much the best of it. This goes on for a certain number of years, when it is found that eyelashes are becoming inverted in alarming numbers; indeed, there are carefully got up statistics to prove that every tenth person is suffering from this terrible disease, the study of which needs a larger sphere than the dispensary, with its 20,000 (!) cases per annum, can possibly afford—in short, the dispensary bud must expand into an hospital. There are certain persons who

seem to have been born only to be manipulated out of their money for the erection of new hospitals. It may be incontestably proved that inverted eyelashes can be treated in the old-established hospitals close at hand; but that fact seems never to have entered the thoughts of the gentlemen and ladies who so obsequiously follow the lead of the ambitious Mr. Ectropium, who is determined that there shall be a building devoted to nothing but misplaced eyelashes, and perhaps—but this is, of course, quite under the rose—to himself. In due course of time the special hospital is completed. The old woman who used to sweep out the dispensary is converted into the proud hall porter; the small table in the back room is developed into the ample board-room; the matron and the house-steward stand in respectful attitudes; and Mr. E. is proudly conscious of the pinnacle of human greatness that he occupies (in his subordinates' eyes at least), when the Board become perfectly conscious that the "establishment" is eating up all their means, and that "unless a charitable public," &c., come forward, thousands of inverted eyelashes will be left to their miserable fate. Such is the history of half the special hospitals at present existing in the metropolis. Founded in the grossest self-seeking on the part of some individual, they are matured only through a system of mendicancy already strained to the uttermost, and which sooner or later must give way. But, let us ask, do these special hospitals subserve to the education of pupils? Most decidedly not. Their tendency is to starve the general hospitals, where the schools are established, of that variety of cases which are so instructive to the future practitioner. Moreover, this splitting up of specialities with a more than Egyptian minuteness has a tendency to destroy that unity of disease which the philosophic mind should always keep in view. The hospitals for inverted toenails and for inverted eyelashes may turn out clever operators in their very confined departments of surgery; but they will never furnish great surgeons, or advance the art beyond mere manipulative smartness. There are certain large specialities, of course, to which our argument does not apply; but these exceptions must be patent to the reader. It is in surgery, more than in medicine, that we have erred in this respect. Let us ask, for instance, what possible necessity there is for the imposing looking building unfinished on the Fulham Road—the future Cancer Hospital. Is there anything in the treatment of this "Fell" disease which requires its isolation from other surgical cases? What peculiarity is there, again, in the treatment of diseases of the rectum, that a special hospital should be devoted to them? And if there is no reason in favour of such hospitals, independently of the scientific and educational evidence against them, there is the one great financial reason, that they squander the means of the charitable. Every one of these petty hospitals has its working staff, besides the building itself, the expense of keeping up which, in many cases, is the chief charge which tender-hearted and humane people are called upon to pay. It is this useless multiplication of machinery which is tending to exhaust the purses of the charitable, and to bring the principle of voluntary contribution into bad odour; and we most heartily hope and trust that our great provincial cities and towns will, in this respect, look upon our London practice as a matter to be avoided rather than to be servilely followed.

DEODORIZATION OF SEWAGE.

The following letters have been addressed to the Chairman and Members of the Metropolitan Board of Works:—

Sir,—Having perused a letter addressed by Dr. Letheby to Mr. Deputy Harrison, to which you called our attention, we now beg leave to express our opinion upon the subject of that communication.

Dr. Letheby states in his letter that he has found in the gallon of "Dales' Perchloride of Iron" not less than 238 grains of chloride of arsenic, adding at the same time that this quantity "is sufficient to poison about forty persons," and "that the form in which the arsenic exists in the liquid is one of the most dangerous of all the compounds of arsenic—far more dangerous than the common white arsenic." He concludes with mentioning that his object "is to warn against the use of so frightfully dangerous a liquid," since, "according to the report of the chemical referees (August 12th, 1859, p. 6), every 1,000,000 gallons of sewage would require 66

gallons of the perchloride to disinfect them, a quantity that contains enough arsenic to kill 2640 persons; and if the whole 80,000,000 gallons of a day's sewage were so treated, it would be necessary to cast into the Thames every day, nearly 180 lbs. of one of the most dangerous preparations of arsenic."

The perchloride of iron manufactured for disinfecting purposes almost invariably contains a small quantity of arsenic, which is derived from the iron ores used in its preparation. We have carefully examined the perchloride used in our experiments on deodorization to which Dr. Letheby refers, and find that it contains 52.1 grains of arsenic in the imperial gallon, which, expressed as chloride of arsenic, amounts to 125.9 grains; from which it is evident that the liquid we worked with contains but little more than one-half of the quantity present in the sample examined by Dr. Letheby.

We lay but little stress upon the difference of results furnished by the experiments of Dr. Letheby and those made by ourselves, for is is our deliberate opinion that even were the perchloride of iron to contain ten times the maximum quantity of arsenic observed by Dr. Letheby, its application for the purposes contemplated in our report could not afford grounds for the slightest apprehension of danger.

This our opinion is based upon the following considerations:—

It is well known that the most efficient antidote of arsenic is the hydrated peroxide of iron, such as is produced by the addition of alkaline liquids to perchloride of iron. The action of this antidote depends upon the formation of a compound of white arsenic with peroxide of iron, which is perfectly insoluble in water, and consequently absolutely innocuous. Now, it will be observed that the addition of the perchloride of iron to sewage, which is a liquid of an alkaline character, involves the conditions for the production of an amount of this antidote, immensely greater than that necessary for the complete precipitation of the arsenic contained in the perchloride.

The ultimate plan of dealing with the sewage contemplated by the board, consisting, as it does, in collecting the sewage in settling reservoirs, and filtering off the deposit formed after the addition of perchloride of iron, it is obvious that this mode of proceeding completely excludes the possibility of the Thames becoming contaminated with arsenic. Although there could not exist any doubt in our minds upon this latter point, we nevertheless considered it of sufficient interest to submit it to the test of direct experiment. Sewage freshly taken from the Fleet sewer, and mixed with the proportion of perchloride of iron recommended by us for deodorization, did not, after filtration, contain a trace of iron, and careful experiments, made with the most delicate tests, failed to detect even the most minute trace of arsenic, proving that the whole had been precipitated and removed from the liquid by the peroxide of iron, formed by the action of the sewage upon the perchloride of iron.

The deposit formed during the subsidence contains the arsenic in a perfectly innocuous form, and, moreover, diluted to such an enormous extent that the last grounds of apprehension entirely disappear.

A very extensive series of experiments give 30 grains as the average amount of suspended matter in a gallon of London sewage. Now, supposing that the addition of perchloride of iron to the sewage gave rise to the deposition of this suspended matter only—whilst, in reality, it at least doubles that amount—the quantity of arsenic as resulting from Dr. Letheby's experiments—viz. 180 lbs. of chloride of arsenic, corresponding to 98 lbs. of ordinary white arsenic, would be diffused in 342,857 lbs. of material, constituting the daily deposit from the London sewage; or one part of arsenic would be mixed with 3000 parts of solid matter.

It is, perhaps, of some interest to compare with this result the amount of white arsenic in some deposits from water which occur in nature.

Modern chemistry has proved that arsenic is much more extensively diffused than was formerly supposed, the ferruginous deposits from the majority of mineral waters, having been found to contain this substance in appreciable quantities. M. Daubrée, a French chemist, who has been engaged in experiments upon this question, has even succeeded in proving the presence of arsenic in sea water. We may here limit ourselves to quoting the proportion of arsenic contained in the deposits of some of the most celebrated mineral springs.

Name of deposit.	One part of white Arsenic in.
Wiesbaden, as determined by Fresenius (deposit in basin of well) ...	961 parts
" " " (deposit in the pipes)	67 "
Carlsbad (deposit in well)	278 "
Deposit from London sewage, deodorized by perchloride of iron	3000 "

But let us now consider what will be the influence of the arsenic in perchloride of iron, supposing this agent to be used for deodorizing the sewage flowing without subsidence into the Thames, such as contemplated by the board until the necessary arrangements for the ultimate disposal of the sewage are completed. It is obvious that the perchloride of iron must affect the sewage exactly as in the previous case, and that the whole of the arsenic will exist in the insoluble or innocuous form before the contents of the sewers are discharged into the river; the only difference then being that the innocuous deposit will, in the latter case, be carried into the river, whilst under the former circumstances it would be retained upon the filter beds.

Now we cannot think that a deposit containing not more than one part of arsenic in 3000 parts of matter, when further diluted with the whole bulk of the river, need cause any serious apprehension. But we may go a step further, and assume for a moment that the whole of the arsenic contained in the daily supply of perchloride of iron could penetrate into the Thames in the soluble or poisonous condition. The average volume of water which passes Richmond daily is calculated to be 300,000,000 of gallons, and if we add to this the supplies which the river receives in its progress to London by tributaries and sewers, we are probably not far from the truth if we estimate the daily volume of water passing the metropolis at 1,000,000,000 of gallons. If the daily quantity of white arsenic, taking as the basis of the calculation the estimate of Dr. Letheby, be diffused through this volume of water, there would be contained one grain of white arsenic in 1450 gallons. The Wiesbaden water, which is generally considered a wholesome water, contains one grain of white arsenic in 166 gallons.

The following considerations may perhaps assist in restoring the equilibrium of the most timid. The daily average consumption of water, as such, and in the form of bread and beer, by an adult, may be fairly estimated at about half a gallon; but supposing an individual, blessed with so thirsty a constitution as to require a gallon, it is obvious that ten years would not have been sufficient to supply him with an amount of arsenic which, if administered in one dose, would prove fatal, and that a quantity of $3\frac{1}{4}$ tons of coal would be required to evaporate Thames water into a potable bulk containing an equal quantity of white arsenic.

It is thus evident that the extreme dilution which the arsenic contained in the perchloride of iron suffers in becoming mixed with Thames water, is alone sufficient to exclude the very idea of danger, even if this arsenic had not been converted, as we have shown it to be, into a perfectly innocuous compound before it reaches the river.

We are, &c.

(Signed) A. W. Hofmann.
E. Frankland.

To the Chairman of the Metropolitan Board of Works.

Gentlemen,—I have just received a printed copy of a report by Dr. Hofmann and Dr. Frankland, on a communication from me with reference to the quantity of arsenic in perchloride of iron; and as the report reflects in some degree on my skill and judgment in the matter, and is, moreover, calculated to diminish the importance of the subject by diverting your minds from the main facts of the question, I beg leave to reply to it.

And here, at the outset, I may remark, that although the reporters have verified, in the most conclusive manner, the principal fact to which I directed your attention, namely—that the perchloride of iron which you were about to use for the deodorization of London sewage is charged with a poisonous compound of arsenic, yet their admission of it is accompanied with so many dangerous fallacies that I am bound to notice them. If it were not for this I should have left the fact in all its plainness for your consideration, being confident that you would have disposed of it in the manner best suited for the public interest.

In the first place, the reporters say, as if it were a matter of but little importance, that "the perchloride of iron, manufactured for disinfecting purposes, almost invariably contains a small quantity of arsenic, which is derived from the iron ores used in its preparation." But I must tell you this is not the only source of the poison, for it comes in far larger proportion from the crude muriatic acid employed as the solvent. Years ago, when Mr. Ellerman first proposed the pyrolignate of iron as a disinfectant, the presence of arsenic in it, from the oxide employed, was considered a serious objection to its use, and now there is an additional danger from the large quantity of arsenic contained in the solvent. What may be the usual amount of arsenic in the perchloride is apparently open to doubt; for the reporters have found only half the proportion discovered by me. I will not pretend to reconcile this discrepancy ; but I may be allowed to state that this recognition of arsenic in all its poisonous forms has been with me a subject of especial study ; and the proportions mentioned in my report are the mean of three nearly concordant results ; and that the sample which I have examined was supplied to me by Mr. Dales "as the same as that reported upon by Drs. Hofmann, Frankland, and Miller."

As to the importance of the fact that arsenic is a constituent of the perchloride, the reporters are of opinion that it need not afford grounds for the slightest apprehension of danger; for they say, "it is well known that the most efficient antidote of arsenic is the hydrated peroxide of iron, such as is produced by the addition of alkaline liquids to perchloride of iron. The action of this antidote depends upon the formation of a compound of white arsenic with peroxide of iron, which is perfectly insoluble in water, and consequently absolutely innocuous." If the reporters had been acquainted with the medical literature of the subject, or had been so circumstanced as to have had any practical knowledge of the *modus operandi* of the peroxide, they would not have spoken so positively of its antidotal powers, or have committed themselves to so erroneous an opinion. More than twenty years ago Orfila, after careful inquiry, demonstrated that the hydrated peroxide of iron was not a protection to the poisonous effects of arsenic; for although it forms a compound which is insoluble in water, it is not insoluble in the acid secretions of the stomach. Modern experience has confirmed this view of its action, by showing that peroxide of iron is not an antidote to arsenic, unless it is used in sufficiently large quantity to cover, or, as it were, to plaster, the walls of the stomach, and so to prevent absorption. Even then it is a worthless antidote, when the poison is in a solid form ; for, to use the words of the last writer on this subject, Dr. Taylor, "it has no more effect on solid arsenic than so much powdered brick-dust, and to rest upon it as a neutralizer of the poisonous action of solid arsenic would be a delusion."

Again, if the reporters had studied a little more deeply the therapeutics of our chalybeate springs, they would have attached no importance, as far as the present case is concerned, to the fact that "modern chemistry has proved the existence of arsenic in the ferruginous deposits from the majority of mineral waters ;" for those waters are never used for domestic purposes. On the contrary, they are so highly charged with medicinal substances as to be used only for medical purposes. It is not correct, therefore, to say that the Wiesbaden water, which contains one grain of arsenic in 166 gallons, is generally regarded as a wholesome water; nor would the reporters, with all their apparent confidence in the antidotal powers of dilution, be rash enough to tell you that such a water is fit for common or domestic uses.

Above all, it is not an unimportant fact, that if perchloride of iron were used for the disinfection of sewage, as much as one part of arsenic would exist in 3000 of the sediment ; for all who are acquainted with the criminal jurisprudence of modern times are aware how serious a matter it is to have arsenic in anything which may, by accident or otherwise, be brought into contact with the human body. Over and over again the presence of this poison, not in the proportion of one part in 3000, but of less than one part in 140,000 of the soil of a graveyard, has embarrassed the labours of the chemist, and obstructed the progress of justice. Many a criminal accused of having murdered with arsenic, has found a successful defence in the fact that the soil in which the dead body has laid may have been charged with arsenic, and may have furnished the poison found in the corpse. Who, therefore, would rashly complicate such an inquiry by adding arsenic to the soil in which a poisoned body may be found? Or why, as in the present instance, should you resort to a

disinfectant, which is not only useless and expensive in its application, but so dangerous in its results; for where, let me ask, would be the chance of a conviction, if, after the saturation of the soil of the Thames with arsenic, a cunning poisoner were to get his victim stranded upon the shore of the river? I beg of you to consider that it is no light matter to resort to a process of disinfection, which might not only be dangerous on its own account, but by impeding the course of justice might also favour the commission of crime.

Lastly, I may remark that the statements made by the reporters concerning the dilution of the arsenic with the water of the river is not altogether in accordance with facts. They say that the average volume of water which passes Richmond daily is calculated at 800,000,000 of gallons, and that with other supplies the quantity of water for diluting the arsenic is not less than a thousand millions of gallons daily. But this is the daily average for one year; it is not the quantity which flows into the Thames during the hot days of summer when the deodorizer would be in use. At that time there is no such dilution of the poison at the points where you would cast it into the stream, for the downward flow of fresh water is barely sufficient to provide for evaporation, and little or nothing goes to the sea. On the contrary, there is an upward flow of the current, and the water of the Thames becomes largely impregnated with sea salt. Then it is that your deodorizer would be used in the largest proportion; and day by day it would be poured into the same body of water, and would oscillate between the ranges of the tide, making it more and more poisonous, until the danger might be beyond a remedy.

Apart, however, from all these considerations, may I venture to ask you what would be your opinion, and what the opinion of the public, if a manufacturer on the banks of the Thames were to cast daily into the river a quantity of refuse containing as much as a hundred-weight and a half of arsenic? Do you think that if a legal prosecution were instituted against him, as most assuredly it would be, the law would be satisfied, or you or the public contented, with the sophistical defence which your reporters have furnished to you? Would it be enough to say that the oxide of iron in the river was the antidote of the poison—that there were mineral springs in Europe with larger proportions of arsenic than the river contains, and that the water of the Thames had diluted it to an enormous degree? I know what your answer would be to such a case, despite the most skilful arguments, and knowing it, I beg of you to consider that by adopting the use of this arsenical perchloride of iron, you would be doing that which the manufacturer is supposed to have done, and would be the means of casting into the Thames as much as a hundred-weight and a half of arsenic daily. I can scarcely venture to think that any kind of confidence in the arguments of your reporters would justify you in adopting such a course, or would excuse you for the mischief that most assuredly would come of it.

I am, &c.,

41, *Finsbury Square.* H. Letheby.

WAY'S ELECTRIC LIGHT.

Some exceedingly interesting experiments took place on Tuesday evening off Osborne-house, the beautiful marine residence of Her Majesty, in the Isle of Wight, and also in Cowes-roads, with Professor Way's electric light, and which we believe are preliminary to more important experiments about to be carried out by the Government. The principle of the light is simply the application of electricity to a column or running stream of quicksilver—in this instance as fine as the point of a lady's needle. So long as the voltaic battery retains power to act with its wires upon this column, so long must the light burn—the strongest and purest light in the known world, and the nearest approach to sunlight that the skill of the chemist and man of science have yet produced, and this without actual combustion taking place or the quantity of the mercury being reduced, the supply of acids to the battery being its sole expense after its first cost, excepting wear and tear. The professor with his apparatus left Portsmouth harbour in a steamer shortly before dark on Tuesday evening, and steered direct for Cowes. On the sponson of the steamer was placed the battery. Abaft the foremast hung one of the professor's simple apparatuses as a mast-head light. On a movable circular platform placed on the vessel's

after-hatch a similar apparatus to the one hung up aloft stood, to which was attached a lens, but both of them as yet unlit. The apparatus is of the simplest possible form, consisting merely of an oval-shaped pair of tubes connected at each end, a round hollow globe about the size of an orange, in which is placed the mercury. The mercury runs from a point to a cup in the centre, enclosed within a glass tube, and here the subtle liquid is heated to a white heat as it flows in a fine stream from the upper ball into the cup, and thence into the lower one, thus producing an indestructible wick. The wires which connect the battery with the apparatus were made by Messrs. Silver, and are, perhaps, the most perfect of their kind yet constructed. These wires are coated with silver, enclosed in india-rubber, and have an outside coating of braided hemp, the whole pliable as common packthread. To look at the light, with a view to a close inspection of the cup, with the naked eye, would be about as useless as to look at the sun at noonday. A pair of coloured glasses, however, show that this light, which can only be compared to the sun for its brilliancy and power, is only of the same circumference as the cup itself—the size of a threepenny silver piece, and of little more diameter. Midway between the aftermost light and the voltaic battery is a brass standard a few inches high, with which the wires are connected, and by pressing a button on the top of this, simple as the key of a piano, the light can be given in flashes of as long or as short a duration as the operator pleases. This is, however, more beautifully and correctly carried out by a small instrument of Mr. Way's. It consists of a piece of clockwork, having in front a revolving disc, the face of which is covered with numerous holes with pins to fit in as may be required. In front of the disc are two small cylinders with pistons and arms attached. As the disc revolves the pins in its face lift the pistons in the cylinders and cut off the connexion between the battery and the lighting apparatus, producing flashes of light of any duration that may be required, with their accompanying intervals of darkness, and admirably adapted for a revolving light, or as a code of signals for night service. In fact, there would appear to be no limit to the uses to which this discovery may be applied, and so simple is it in its manipulation that the choicest music of the great masters may be henceforth accompanied by expressive flashes of electric light. When the steamer arrived off the Motherbank the light aloft was lit by attaching to it the ends of the wires from the voltaic battery. So soon as the glass tube became sufficiently heated to throw off the mercury from its surface the light exhibited its power and beauty, the steamer's usual mast-head light, which was hoisted in its usual position, appearing but a dull red speck alongside it. Its effect upon the human countenance was, however, by no means favourable, casting on all on board the steamer a strange unearthly hue. Mauve colour, as it has become fashionable to term it on the ladies' dresses or bonnets, was brought out by the light with astonishing brilliancy. On reaching Cowes-roads, crowded with yachts, and all displaying lights, the contrast between the electric light and those shown by the yachts was something wonderful. The electric light was shining in its pale pure brilliancy aloft, while the hundreds of lights displayed by the yachts and by the town of Cowes, its Club-house and hotels, dwindled down to dull red specks. The lens applied to the after light threw broad pathways of light to and fro as the lens might be directed, bathing the low black hulls of the craft that were in the line of light with a flood of sunshine, as also the delicate tracery of their spars and rigging. A boat which left the steamer here for one of the yachts was lighted on its way by the lens. On the steamer's return Norris Castle was passed, and the light thrown on its picturesque front. Ivy-covered towers, walls, and parapets were illuminated as with a stroke from an enchanter's wand. Off Osborne House the steamer was stopped for some time, and the light must have shown itself with good effect on the still waters of the Solent, in front of the beautiful marine residence of Her Majesty. The experiments, which, as already stated, are only preliminary to more important ones, were considered to have been fully satisfactory. With a light on this principle under her bows, the Great Eastern herself might have lighted her path across the waters of the Atlantic.—*Times*, August 3.

PHOTOGRAPHIC PRINTING PAPER.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—Like many of our profession, I have been much engaged in the preparation of the various articles used by photographers. The several journals expressly devoted to that particular science have given their readers a variety of formulæ for the exciting of albumenized paper used in printing positives, and much has been said about their preservation after excitement in the silver bath. Although a reader of most of these periodicals, I have seen no insertion made of a plan I have myself used for the last two years with invariable success. By the present modes excited papers will keep good barely a few days. I can, and have, kept them weeks. My plan is after excitement to dry them thoroughly by a gentle heat, and immediately to put them in a box, similar to the ordinary pressure frame, placing a sheet of yellow paper between each, and keeping them *tightly screwed* down in a *dark* and *dry* cupboard.

I remain, Sir, yours respectfully,

Ipswich. J. WIGGIN.

REMUNERATION TO PHARMACEUTICAL ASSISTANTS IN AUSTRALIA.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—Having been decoyed out to Calcutta in 1852 under similar, but far more unfortunate, circumstances than those detailed in the accompanying cutting from the *Melbourne Argus*, I trust you will give it a place in your Journal, that it may act as a caution to those who contemplate engagements in the old for occupation in a foreign country. Such a course as here represented on the part of the employer cannot be too strongly censured, in reference to countries where *ascertained character* is so valuable, and where *really good* assistants are so rare. For some years I have been an employer, and though I have frequently engaged what we call "new chums," I have never paid less than *three* pounds per week, and often *five* and more pounds, for *what is called* "competent assistance."

A faithful servant knows nothing of *overwork*, nor his good master of *overpay*. There is a kind of labour beyond all price, and a description of appreciation beyond all praise; and I need scarcely remind your readers that the business of a Chemist and Druggist requires more mutual concessions and consideration between the employer and the employed than any other.

There is good opportunity in connexion with our trade *for men of good character and ability* in this colony; of inebriates and incapables there are already far too many.

I am, yours, &c.,

JOSEPH B. FRENCH,
Member (by examination) of the Pharmaceutical Society of Great Britain.

"*Talbot Drug Store*," *Castlemaine, Victoria, June* 16*th*, 1860.

"In the New Court, yesterday, an action was tried between a Mr. Thomas Obbinson and Messrs. Ford and Dickson, the chemists, in Swanston Street. It appeared that Mr. Ford, when in England, in the latter part of 1858, had engaged the plaintiff, who was a chemist and druggist's assistant of 20 years' standing, as his assistant to come out to Melbourne, the engagement being for three years, the salary for the first year being £80, and increasing £10 each year subsequently. Board was included. Mr. Ford had told Obbinson that the average salary in Melbourne was about £100 a year, whereas yesterday it was sworn that it averaged from £100 to £200 per annum. Mr. Obbinson had his passage paid for him, second class, the cost being £32, and some small expense in preparing an outfit was also defrayed. Some time after his arrival, Mr. Obbinson, finding his rate of remuneration so very small when compared with what others were receiving in the same occupation, applied for an increase of salary, which, after some demur, was promised to him, though accompanied with such insulting language—as the plaintiff deemed it—as made it evident to him that

he could no longer remain with any degree of comfort in Messrs. Ford's employ. He accordingly said he should look out for another situation, and told Mr. Dickson (Mr. Ford's partner) that he should go down to Geelong, and see about a situation that was then vacant; and Mr. Dickson said that he would advise him to leave, and had no doubt Mr. Ford would agree for him to do so, provided he paid back the passage money. He accordingly went down to Geelong, and had been away but two days when an advertisment was published in *The Argus*, 'warning all chemists and druggists from employing the plaintiff, as he was an absconder from Messrs. Ford's service.' Evidence was brought to show that, in consequence of this advertisement, it had been absolutely impossible for the plaintiff to obtain another situation, as every one refused to receive him under the circumstances. The jury found a verdict for the plaintiff, damages £48."—*Argus*.

[A similar communication, referring to the same case, has been sent us by Mr. Wm. Johnston, of Melbourne, who had previously corresponded with us (see *Pharm. Journ.* for July, page 40) on the subject of assistants and their salaries at Melbourne.—Ed. *Pharm. Journ.*]

MISCELLANEA.

The Metrical System in Weights and Measures.—At the meeting of the International Statistical Congress, Mr. S. Brown read a paper "On the Units of Money, Weights, and Measures." In the discussion which followed, Sir J. Bowring and Sir C. Pasley opposed the introduction of the metrical system in any form. The following propositions were carried:—

"That it be recommended to the Congress that, in countries not using the metrical system, the column containing the reduction of all weights, measures, and values to the terms of the metrical system,—according to the resolution of the first International Statistical Congress,—be added to all statistical tables which it shall be decided to publish as international tables. That the Government delegates from all countries in which the metrical system is not in use should be requested to urge upon their respective Governments the great advantages attending the adoption of the metrical system in weights and measures; and that all changes hereafter made should have in view to bring this system into general use. That each Government should be requested to institute an inquiry into the existing weights and measures, whether local, customary, or established by law, so that comparative tables may be formed by reducing them all to the terms of the metrical system. That an International Commission be nominated by the Congress, to whom the results of these inquiries may be submitted for the purpose of preparing a report for the next Congress on the actual systems in use, and on the best means of overcoming the obstacles that may exist in any country to the establishment of the metrical system in weights and measures."

At the General Meeting of the International Decimal Association, the following resolutions were adopted:—

"The simplicity, convenience, and efficiency of the decimal system of money and accounts, recommend it for general adoption. The Section recommend the adoption, as far as possible, of a common degree of fineness in gold and silver coins. The Section also recommend that the Government Delegates from all countries in which a decimal system of coinage has been adopted be requested to collect all facts showing whether any or what inconveniences have resulted from such changes, and how such inconveniences, if found to have existed, have been met and remedied. That an International Committee be nominated by the Congress, to whom the results of these inquiries may be submitted for the purpose of preparing a report for the next Congress on the actual systems in use, and on the best means of overcoming the obstacles that may exist in any country to the establishment of the proposed changes."

Gun-Cotton as a Filter.—Boettger recommends the use of gun-cotton as a filtering medium for highly corrosive and easily decomposed liquids, for which powdered glass and asbestos have been hitherto employed. It answers perfectly for strong nitric acid, fuming sulphuric acid, chromic acid, and concentrated solutions of permanganate of potash. It may even be used for concentrated potash ley, and

aqua regia. Boettger employs the gun cotton loosely packed in the neck of a funnel.—*Lond. Med. Review.*

Chloride of Zinc with Gutta Percha.—M. Sommié, in the *Bulletin de Thérapeutique* for June, recommends chloride of zinc in cylinders as an escharotic, to be prepared in the following manner:—

Gutta percha is first softened with boiling alcohol, and then incorporated in a warm porcelain mortar with an equal portion of chloride of zinc in a fine state of division. The mass is then rapidly rolled out on a porphyry slab, in the manner of making pastilles. The cylinders should be made of the size of a quill, and divided into portions of several lengths, and kept in wide-mouthed bottles with a little powdered chalk. The advantages of this preparation are, that it does not liquify on exposure to the air, and is much more manageable than the chloride of zinc.

Stearate of Iron.—A preparation under this name is recommended by Ricord to be made in the following manner:—

Take of Sulphate of Iron, one part.
" Hard Soap, two parts.

Dissolve them separately in about three times the weight of water, and mix the solutions. A greenish precipitate is the result, which is separated and dried, and then melted by a gentle heat. When melted, it is spread on cloth like an ordinary plaster.—*Chemical News.*

How to Discover Leaks in Gas-Pipes.—The usual way of looking for them with a lighted candle, our readers know, sometimes results in an explosion, a fire, and one or two deaths. Now, M. Fournier suggests another way, which is very simple and perfectly safe. He charges the pipes with ammoniacal gas, and then goes along them with an open bottle of hydrochloric acid. Our readers know the rest. M. Fournier claims one of the Monthyon prizes for his invention.—*Dublin Hospital Gazette.*

Preservation of Lemon Juice.—Mr. Schweitzer, in a communication to the *Chemical Gazette*, states, as the result of experiments on vegetable acids, that the addition of 10 per cent. of alcohol to fresh lemon juice prevents any decomposition, and renders it perfectly suitable for exportation or naval use.

Smoking.—The pupils of the Polytechnic School in Paris have recently furnished some curious statistics bearing on tobacco. Dividing the pupils of the college into groups, the smokers and the non-smokers, it is shown that the smokers have proved themselves in the various competitive examinations far inferior to the others. Not only in the examinations on entering the school are the smokers in a lower rank, but in the various ordeals they have to pass through in a year, the average rank of the smokers had constantly fallen, and not inconsiderably, when the men who did not smoke enjoyed a cerebral atmosphere of the clearest kind.

Charge of Manslaughter against a Druggist.—On Monday, July 30th, an inquest was held at Hockley Hill, Birmingham, before Dr. Birt Davies, on the body of Sarah Sanders, aged 39, the wife of a carpenter. It appeared from the evidence that the deceased, who was five months advanced in pregnancy, on the previous Wednesday was seized with severe pains, and at her own request Mr. White, Druggist, of Handsworth, who had attended her in her last two confinements, was sent for at a quarter-past four in the morning. Mr. White administered some medicine, and remained nearly three-quarters of an hour; a respectable married woman was also in attendance. He went again between eleven and twelve, but before his arrival the child was born. The patient being in a very weak state from loss of blood, Dr. Nelson, at the request of Mr. White, was sent for, but before the medicines could be procured, the patient died. It appeared also that the "after birth" adhering to the side, it was forcibly removed by Mr. White. Dr. Nelson stated that the immediate cause of death was hæmorrhage, but that the medicines administered to the deceased by Mr. White were proper in such a case. A *post-mortem* examination was made by Mr. Pemberton, who stated that a considerable laceration had been caused, and that the hæmorrhage which ensued was the cause of death.

Dr. Davies, in summing up, said it was not for the jury to consider whether Mr. White was qualified or unqualified medically; the question was, did he ignorantly or rashly act in the manner described. The jury returned a verdict of "Manslaughter" against Mr. White.

On the 4th of August the prisoner was tried at Warwick, before Mr. Justice Williams, when the counsel for the defence endeavoured to prove that death was caused by diseased action and placental hæmorrhage. The prisoner was acquitted.

Poisoning by Arsenic.—A labouring man, named Dodds, died somewhat suddenly at Wrangle. He had been attended by a surgeon for a slight illness, and on the 21st of July his wife went to the doctor to inform him that her husband was better. She received a tonic to complete his convalescence, and on her return home called at the shop of Mr. Cherrington, druggist, &c., of Leake, and asked for a quarter of a pound of arsenic, stating that her husband was suffering from a severe toothache, and required it to relieve the pain. After some little hesitation she was supplied with the arsenic, being well known. Next day the doctor was brought to Dodds, who was ill with purging and vomiting, and in a state of collapse. He thought the man had English cholera, and prescribed accordingly. The poor man died the same evening in great agony. A certificate of death from bilious diarrhœa was given, and the body was interred on the following Tuesday. Suspicious circumstances having transpired, an inquest was held on the deceased by Mr. J. C. Little, coroner, when a *post-mortem* examination of the exhumed body was ordered to be made by Dr. Mercer Adam, of Boston, and Mr. Cummack, of Benington. At the adjourned inquest on the 6th of August, Dr. Adam deposed that the stomach and intestines were found highly inflamed, and that large quantities of arsenic had been found adhering to their mucous coats. He had also analyzed the liver, spleen, and other removed *viscera*, and had found all these organs completely saturated with arsenic. Mr. Cummack corroborated this evidence. Several witnesses were examined, who swore that the deceased and his wife had not lived comfortably together. The packet of arsenic purchased by the prisoner was found in her possession, and it was ascertained that one ounce of it had been used. The jury returned a verdict of "Wilful murder," and the prisoner was committed for trial to the next Lincoln Assizes.

[The above case forcibly illustrates the degree of attention paid in some parts of the country to the provisions of the "Sale of Arsenic Act;" but that in any case the application for "*a quarter of a pound of arsenic for the toothache*" should have been complied with, seems almost incredible.]

Suicide by Prussic Acid.—On Thursday morning, July 26, Mr. William John Payne, the coroner for the Duchy of Lancaster, received information of the death of Miss Velara Haswell Waight, aged 24, who resided at Stroud. A young woman was on Wednesday wheeling a perambulator with some children in it on Clapham-common, when her attention was attracted by a young woman lying on the grass, apparently dead. Dr. Parrot was sent for, and the deceased was conveyed to the Windmill Tavern. The medical gentleman was promptly in attendance, and used every means to restore animation, but, unfortunately, without avail. By her side on the grass was a phial which had contained prussic acid; a letter from her sister, Miss Catherine Waight; a handsomely bound Bible, a present from her sister; and in her hand some sugar-candy, on which she had dropped the poison. No cause is assigned for the suicidal act.

Suicide by Oxalic Acid.—On Tuesday, August 21st, a woman named Rebecca Stephens, who kept a general shop at 8, Wellington Place, Stepney, committed suicide by swallowing oxalic acid. The deceased was very industrious, and the mother of eight children. She had been a widow about three years, and latterly had cohabited with a man named Sundergreen, and in consequence of some differences with the latter, she had been in a desponding state.

A cup containing the remains of oxalic acid was found in the room, and it was proved that she died from the effects of that poison.

CONTAMINATION OF A WATER SUPPLY.

(*Chester.—Before Mr. Baron Bramwell.*)

An action was brought by the Stockport Waterworks Company against Messrs. Henry Turner, Thomas Norris, and John Turner, the owners and occupiers of print-works, on a stream which is one of the tributaries of the Mersey, for damage resulting from the pollution of the stream by the discharge into the same of poison-

ous fluids from defendants' works. Mr. Collier, Q.C., Mr. Coxon, and Mr. Macintyre, appeared for the plaintiff, and Mr. Welsby, Q.C., Mr. Grove, Q.C., and Mr. H. Lloyd, for the defendants. It was stated in evidence that Stockport had been supplied with water from the Mersey since 1825, at which time the water was comparatively pure, but numerous print and other works had in the course of time been erected on its banks, and the water had become contaminated, and in 1858 the Waterworks Company had consulted Prof. Calvert, who had examined samples of the mud and water, in which he had found considerable quantities of arsenic. Samples of mud and water taken from the reservoirs above the Waterworks were found to contain arsenic. In 1 lb. of the mud, 4.17 grains of arsenic were found. For some time there was no arsenic found in the water supplied, as it had taken a solid form in the reservoirs, but the directors wishing to guard against any accident, had consulted both Professor Playfair and Professor Miller, who had analyzed samples of mud and water taken from the river, and of water taken from the top of an inn in Stockport, as supplied from the Waterworks, in all of which arsenic was found.

Prof. Miller found the water to contain carbonate of lime, carbonate of magnesia, and oxide of iron, which were all precipitants of arsenic.

It was contended for the defence that 10 grains of solid matter issued from defendants' works, and this was only 4 grains in excess of the normal conditions of the water, and it could not be pretended that such an amount could contaminate the Stockport Waterworks at a distance of 13 miles. Besides which, between the defendants' works and the waterworks, there were no less than 103 other works in which arsenic and all sorts of similar ingredients were used. It was also contended that the small quantity of arsenic said to be contained in the water, would be rendered innocuous by the presence of carbonate of lime, and other salts. It was stated by Mr. J. M'Connell, manager for the defendants, that in consequence of an alarm being raised about the use of arseniate of soda, phosphate of soda was now used in its place.

Mr. Dugald Campbell and Dr. Alfred Swaine Taylor were of opinion that the solid matter from the defendants' works, in the quantity indicated, would be precipitated before it had travelled 13 miles, by coming in contact with the lime, magnesia, and ammonia in the water.

The learned Judge then stated the legal bearings of the case to the jury, who returned a verdict in favour of the plaintiffs.

ALLEGED POISONINGS BY ANTIMONY.

After repeated remands, Thomas Winslow was brought up, July 27th, before Mr. Raffles, the stipendiary magistrate, on the charge of having caused the death of Mrs. Ann James, of Vauxhall Road, by means of antimony. There were also charges against the prisoner of having poisoned Mrs. Townsend, sister to Mrs. James, and William and Samuel Townsend, her sons, but the magistrate declined to receive the evidence in these cases, on the ground that, according to the opinion of Lord Campbell, evidence could not be received which did not tend directly to criminate the prisoner in the crime with which he was charged.

The facts of the case, as elicited in the previous inquiries, were briefly stated in our last number, page 149.

Jane Cafferatta, niece of Mrs. James, and daughter of Mrs. Townsend, was the first witness examined, and deposed to the general routine of the business carried on by the deceased, in which witness, together with her father, mother, and three brothers, assisted. In 1854, the prisoner became acquainted with the deceased, and soon afterwards was taken in to assist in managing the business, which was that of an eating and lodging house. In 1855, witness and her husband went to Manchester, after which time she was in the habit of visiting her aunt, who appeared to be on very friendly terms with the prisoner. Witness stated that her aunt was subject to bilious attacks, attended with considerable purging and vomiting. In February last witness received a letter from the prisoner, stating "if you wish to see your dear aunt alive come immediately." Witness found Mrs. James very ill, and remained with her a fortnight, and left her nearly convalescent. During this time deceased was waited upon by two servants, the prisoner, and witness, and when arrow-root or tea was required it was brought by the prisoner to witness, who gave it to Mrs.

James. On the last day of April witness received another letter from the prisoner, containing a post office order and a request that she would go to Liverpool immediately. She went on the following Thursday, and found her aunt very ill, complaining greatly of sickness. Witness then remained with her till the time of her death. During this illness she was attended to by the prisoner and servants as before. Dr. Cameron was sent for by the prisoner on the Tuesday after witness arrived. The deceased improved, and then got worse. Dr. Cameron gave instructions that the dejections and other evacuations of the deceased should be kept. This was done, and he took them away. On the evening of the 9th of June witness prepared some sago in a china teacup and gave it to her aunt, who took it all, and slept afterwards for several hours. On getting up in the morning witness saw a cup or two on the table, which had not been there when witness fell asleep. The prisoner had access to the room in the interval. The cups were left till Dr. Cameron came, which was about 11 o'clock. Witness did not put antimony into her aunt's food, and never saw antimony in her life. Up to the time of her aunt's death witness did not know that the former had any property beyond the furniture in the house and the goods in the shop.

In cross-examination by Mr. Cobb, the witness said her husband never put any carbonate of soda in her aunt's food, or interfered with it in any way. She (witness) never put carbonate of soda in her aunt's food. On one occasion witness's husband went to William's for her aunt's medicine. He once went to Dyson's and brought a bottle of medicine. It made her very sick. She threw it up, and would take no more. Witness did not think she ever saw her aunt in the hospital, except in the presence of the nurse, or, at all events, except when she was very near.

Henry Cafferatta, husband of the preceding witness, stated that about a week before Mrs. James's death the prisoner complained of being ill with vomiting and purging. Witness persuaded him to go to a doctor, but he did not go, but at last agreed to accompany the witness to a doctor, and they went part of the way, but the prisoner soon said he was better, and returned to the house. Some days before Mrs. James's death prisoner called witness a poisoner, and said that he went about with white powders in his pocket, poisoning the family. The white powder was a little carbonate of soda, which, being troubled with indigestion, he was in the habit of taking to correct the acidity on his stomach.

In cross-examination he said, as an ornamental painter and japanner he never used antimony in his life. Never heard of it being used in that trade. Had frequently visited Mrs. James's house since his marriage, and cannot say whether he has done so more frequently during the last twelve months.

At about 4 o'clock the Court adjourned to Monday morning, July 30th, at 10 o'clock.

Peter Downes, assistant house-surgeon to the Southern Hospital, remembered the late Mrs. James being brought to the hospital on the 10th of June last, and placed in a room under the special care of Dr. Cameron. Witness attended her also, but Dr. Cameron prescribed for her. On her arrival at the hospital she was very much emaciated, and suffering from purging and vomiting. Witness, according to instructions from Dr. Cameron, directed the nurse Hughes to preserve the motions and vomits of the patient, which was done. She was incapable of retaining food on the stomach; her tongue was red, and she presented all the symptoms of gastro-intestinal irritation. On Monday, the 11th, she was a little better; on Tuesday, the 12th, the purging recurred more violently, and the pulse had risen to 120. From this time to the time of her death, the symptoms were purely those of exhaustion, except that on the Friday preceding her death there was a sudden increase of abdominal pain and tenderness. At the time of her death on Sunday she had no convulsions, but died as if from exhaustion. The prisoner frequently visited the deceased during her stay in the hospital, and nearly always appeared excited from drink.

In reply to Mr. Raffles, the witness detailed more minutely the symptoms of the deceased. They were chiefly constriction of the throat, cold clammy sweats, the tongue becoming aphthous, &c.

Cross-examined by Mr. Cobb.—Had not seen a case of cancer of the stomach, but knew the symptoms. Ulceration of the stomach produced sickness, but ulcera-

tion of the bowels seldom did. Gastro-intestinal irritation, such as the deceased laboured under, might be produced by natural causes, and would produce death. Knowing the cause of death, witness would attribute the increase of pain and tenderness in the abdomen to perforation of the bowels. During life the limbs of the patient were not contracted; she lay flat in bed. Previously to her death, witness knew that she was affected with cancer of the cœcum. All the symptoms witness had described were perfectly consistent with cancer of the cœcum and ulceration of the stomach.

Archibald Tapper, who was a patient in the Southern Hospital in June, proved the identity of the bottles which he had received from Dr. Downes, and their conveyance to the laboratory of Dr. Edwards in Seel Street.

Benjamin Dickens, assistant to Dr. Edwards, proved the reception of the bottles and their delivery to Dr. Edwards; and *Owen Scott*, an errand-boy to Dr. Edwards, completed the formal evidence of the fact.

Dr. Cameron, honorary physician to the Southern Hospital, remembered the prisoner calling on him on the 5th of February, and stating that he had advised Mrs. James, who was very ill, to send for witness. Attended Mrs. James on the same day, and found her in bed. She was much emaciated, was suffering from purging, and either had vomiting at that time or had recently suffered from it. On examination, witness distinguished on the right side of the abdomen a tumour, which, connected with the symptoms, he believed to be malignant. The patient was greatly prostrated, and stated that she had for some time been subject to attacks of diarrhœa and vomiting, but she laid most stress on the diarrhœa. She added, also, that these symptoms had been much aggravated since Christmas. Witness prescribed, and left with the understanding that he was to be informed of her progress. Two or three days afterwards, witness was visited by Winslow, who stated that she was better; and he did not visit her again till the 29th of March following, when he was again called on by Winslow, who informed him that Mrs. James was much worse. Witness found that her symptoms were much the same as on the occasion of his previous visit. Ascertained, on inquiry, that in the meantime she had improved greatly, but had not completely recovered, and had recently relapsed. Similar relapses occurred about the 8th and 20th of May, and the 6th of June. During the progress of her case, sudden and violent attacks of purging and vomiting set in, attended with remarkable prostration, with intervals of comparative health; the medicines administered had an unusually good effect in relieving the symptoms; and witness could not account for the violence of her symptoms, nor their mode of presenting themselves, by the disease which he believed her to be suffering from—cancer of the cœcum. Witness was, therefore, led to believe that the deceased was suffering from some foreign irritating substance; and it was for that reason that witness procured the urine, and left it at Dr. Edwards's laboratory. On the 9th of June, witness carried away matters vomited by the deceased, as well as matters passed by the bowels, and delivered them to Dr. Edwards. On the 10th, the deceased was removed to the Southern Hospital, in consequence of representations which witness made to Mrs. James, to the effect that she was suffering from poison, and that it was absolutely necessary for her safety that she should be removed from the house. He was informed by the deceased that the vomiting and purging had come on violently during the night. There were also on the table two or three cups, and a few bottles containing medicine, wine, and brandy. One of the cups contained sago, which appeared to have been prepared, and was taken possession of by Inspector Horn. As soon as Mrs. James was dressed she was removed in a car to the Southern Hospital, where she remained from the 10th till the 24th of June, when she died. From the 10th to the 22nd her state was variable, but there was no marked change in her progress. On the afternoon of the 22nd she was suddenly seized with severe pain in the abdomen, accompanied by extreme collapse. She never rallied, and died at eleven o'clock on Sunday morning, the 24th. Witness was present at the *post-mortem* made by Mr. Pemberton six hours after death. Externally the body was much emaciated. On examining the œsophagus, the lining membrane was found deeply tinged with yellow. At a short distance from the orifice of the stomach were two patches of hardened lymph. On opening the stomach that organ was found considerably distended, and containing about a pint

of thick greenish-yellow fluid. At the smaller end of the stomach were two ulcers, one about one-eighth of an inch in diameter, and the other a little longer; they were circular, and their edges softened. On being probed, it was found that they communicated with the substance of a tumour about to be described. On examining the intestinal canal, the upper part, or duodenum, was found to have a few patches of superficial redness. The remainder of the small intestines presented no appearance of disease. In the large intestines, in the part of the bowel called the cœcum, was found a cancerous tumour, four by five inches in each direction, and from one inch to one and a half inch in thickness. This tumour involved the coats of the bowel, in which it had originated. On its inner aspect the surface was irregularly ulcerated. On the upper and right side of the tumour were found small and ragged openings, through which the contents of the bowel had escaped into the peritoneal cavity. It was in the upper part of this morbid mass that the ulcers already alluded to terminated. The disease was strictly limited to the cœcum, terminating abruptly both above and below. The folds of the coat of the larger bowel throughout the remainder of the course presented patches of superficial redness, which became more numerous towards the rectum. In the right side of the peritoneal cavity were found several ounces of thick fluid, which had escaped from the bowel, and given rise to irritation in the peritoneum. The intestines throughout their whole extent were remarkably empty. The liver, the spleen, and the kidneys presented no unusual appearance; left lung healthy, and lower part of the right lung congested, and of a deep red colour; heart and brain healthy. During his attendance on Mrs. James, witness received from her a statement of her previous health. She stated that for the last four or five years she had had what she called good health; but had been subject to looseness of the bowels, by which she meant that when she took indigestible food a bilious attack was induced. She dated the commencement of her serious illness from December last. The change to which she alluded was the occurrence of diarrhœa with vomiting, not constant, but occurring occasionally.

Dr. Cameron was then cross-examined by Mr. Cobb.—His suspicions as to poisoning were confirmed after Dr. Edwards's first analysis on the 7th of June. He gave tannic acid as an antidote on the 31st of May, but the usual treatment he had adopted—viz. the administration of small doses of morphia—was regarded by him as the most judicious under the circumstances of the case. Vomiting and purging were efforts of nature to carry off the poison. Had seen a similar disease to that of Mrs. James, but there was no vomiting, and constant and slight diarrhœa. The case was fatal, and there was a *post-mortem;* but there was no ulceration of the stomach in this case. On his first visit there was more purging than vomiting, and that clearly indicated disease of the bowels.

Re-examined.—Saw the vomit every day while the patient was in the hospital; it was uniformly of a brownish-green hue.

Dr. Edwards, analytical chemist and lecturer on toxicology, deposed:—On Thursday, 7th June, he received a bottle containing urine from the witness Dickens, and found in it a trace of antimony. On the 9th of June received from Dr. Cameron two bottles, one containing fæces. Analyzed it, and found a trace of antimony. The other bottle, which contained vomit, gave two considerable deposits of antimony. Received from the witness Dickens, daily from the 12th to the 22nd of June, bottles containing urine, fæces, and vomit, duly labelled. Found antimony daily in the urine and fæces, and in the vomit of the 10th, 14th, and 20th only. Received also from Inspector Horn a small bottle of port wine, but it contained no antimony. Also two cups containing a tablespoonful of cooked sago, one cup being used as a cover to the other. Analyzed the sago, and obtained two considerable deposits of antimony. The witness also analyzed the viscera of the deceased, and also the bile, blood, fluids, &c. From one-half of the stomach he obtained five antimonial deposits; from rather more than one-half of the intestines, five antimonial deposits; from the kidney, four antimonial deposits; from about 2lbs. of the liver, three antimonial deposits; from the brain, no antimony; from 3 oz. of the bile, no antimony; from 4 oz. of the blood, a distinct antimonial deposit; from the fluid in the stomach, measuring about a pint, he obtained a considerable deposit of antimony; from the fluid in the peritoneal cavity, about 12 oz., a slight trace of

antimony; the medicines received by him from Inspector Horn contained no antimony. The method of analysis in each case was to digest the fluids with hydrochloric acid, and the solids with hydrochloric acid and water. Having obtained a solution, he added a slip of copper. Had separately analyzed the acid and the copper, and ascertained that they were free from antimony. The deposits referred to were the thin films of metallic antimony which become precipitated upon the surface of the copper when that metal is present. As far as possible he observed the same conditions with respect to the quantity of acid and the duration of the experiment in all these cases, and the quantitative opinion which he had given was founded upon the colour of the copper after it was coated. The deposits from the vomit were heated in a tube, by which they became oxidized and sublimed. The oxide was then dissolved in tartaric acid, and sulphuretted hydrogen gas was passed through the solution, and an orange-coloured deposit of sulphuret of antimony was precipitated. The deposits obtained from the urine and from the fæces were digested with a little potash, which dissolved the film of antimony. Sulphuretted hydrogen was passed through this solution, and the fluid filtered; it was then acidulated with hydrochloric acid, and precipitated as an orange sulphuret of antimony. This was tested with ammonia, in which it was found to be insoluble. It was dissolved again in hydrochloric acid, and placed in a Marsh's apparatus, in which pure hydrogen gas was being disengaged. On heating a portion of this apparatus, the metallic antimony was recovered in the form of a black mirror, which was found to be insoluble in a solution of chloride of lime. No substance, he believed, would give all these reactions except antimony. The same process was followed in reference to the deposits obtained from the viscera, with precisely the same results.

Cross-examined.—The appearance of the mucous membrane might be altered if kept in spirits of wine for a few days; it would become paler.

Dr. Alfred Swaine Taylor was next called and examined.—Received some jars, containing portions of the deceased, from Dr. Edwards, on the 10th of July; and subsequently received other jars. With the exception of the spleen and the lungs, he divided the viscera and delivered one-half to Dr. Miller. Examined portions of the viscera for antimony and for arsenic. Found antimony clearly in the spleen, the lungs, and the liver. The other portion of the viscera did not present any traces of antimony. Examined the spleen in the presence of Dr. Edwards, and the liver and the lungs both with Dr. Edwards and Dr. Miller. With Dr. Miller he also examined the deposits on copper produced by Dr. Edwards, and some sublimates on glass, obtained by Dr. Edwards in his analysis of the viscera, and he further examined with Dr. Miller the deposits on copper which Dr. Edwards had obtained from the urine and the excretions. The result was, beyond any doubt in our minds, that the deposits were produced by antimony present in the body of the deceased. Finding the antimony diffused through those organs, he formed the opinion that the antimony had entered the body of the deceased during life. From an examination of the viscera, there were no appearances which could lead him to the cause of death except the cancerous disease of the cœcum. In the analysis he adopted the mode described by Dr. Edwards, in his presence, and in the presence of Dr. Miller; and all were equally satisfied that the deposits and sublimates were due to antimony. Had heard the symptoms of the deceased during her illness described, and should imagine that death was owing to the diseased cœcum. The symptoms of vomiting and purging were such as small doses of antimony would produce. Hearing that antimony was found in the vomited matters as well as in the fæces, he should attribute those symptoms to the action of antimony; but how far that contributed to the death of the deceased, he found it impossible to give an opinion.

By Mr. Cobb.—The symptoms he had heard described, as observed in the deceased, might arise from ulceration of the stomach, but in that respect he agreed with Dr. Cameron that disease of the cœcum is more commonly attended with purging than with vomiting; the difficulty which had to be accounted for was the presence of antimony in the vomit. Small doses of tartar emetic would irritate the mucous membrane, and, if frequently repeated, would cause inflammation of the stomach and bowels.

Dr. Cameron, on being recalled, said, in reply to Mr. Aspinall, that, having heard the chemical evidence as to the finding of antimony, he attributed the immediate

cause of death to perforation of the diseased bowel; but finding antimony in the matter vomited during life, and in the matter passed from the bowels, together with the symptoms under which the deceased laboured, and the extent to which antimony was found in the body after death, he was of opinion that the death of Mrs. James was accelerated by the administration of some preparation of antimony during life.

Mr. Raffles.—You think she would not have died so soon but for the administration of antimony ?

Witness.—I do.

By Mr. Cobb.—It would have been quite impossible for the deceased to recover from the disease under which she laboured.

Dr. Taylor, in reply to Mr. Cobb, said that antimony might remain in an absorbed state in the tissues for four or five weeks after the administration of the last dose; but, according to his experience, it generally disappeared in two or three weeks. If it were true that Mrs. James lived fourteen days after the last administration of the antimony, then he should not expect to find such appearances as if administered shortly before her death. Assuming that antimony was administered, for the last time, fourteen days before her death, he should still think antimony accelerated her death. That might well be, because it would depend upon the exhaustion produced. It might, by producing exhaustion, render her in a state of body more likely to yield to the disease.

Mr. Clarence Pemberton, who made the *post-mortem* examination of Mrs. James's body, was examined. His evidence was merely corroborative of that given by Dr. Cameron as to the appearances after death. He stated on cross-examination that all the symptoms exhibited by Mrs. James while in the hospital were reconcileable with the disease in the cœcum, but from the previous history of the case, and the chemical evidence, he had no doubt that death was accelerated by the administration of antimony.

Inspector Horn was the next witness. He deposed to finding a cup containing a portion of cooked sago, which, on being analyzed, was found to contain antimony, although the parcel, uncooked, out of which it had been taken, contained no trace of that poison. He also deposed to finding a printed form of a will, which the prisoner said he had purchased for the purpose of making Mrs. James's will himself. To this witness the prisoner, on being charged with poisoning Mrs. James, admitted that he knew the use of antimony, but said he had not used any for fifteen years; and he also pointed out a drawer in which he (the witness) found a bank-book, showing £135 to the credit of Mrs. James, a receipt for four £25 shares in the Liverpool Gas Company, a gold watch and chain, £35 in cash, and the will of the deceased.

Some further, but not very important, evidence was given, at the conclusion of which Mr. Raffles committed the prisoner for trial at the assizes.

The trial, which occupied three days, commenced on Monday, August 20th, before Mr. Baron Martin.

The Attorney-General for the County Palatine (Mr. Bliss, Q.C.), Mr. Aspinall, and Mr. Leofric Temple, appeared for the prosecution; and Mr. Seymour (Palatine Silk), Mr. Littler, and Mr. J. Fenwick, for the defence.

The evidence adduced differed in no material particular from that given above.

Mr. Seymour, in addressing the jury for the defence, contended that, if the death of the deceased were hastened by antimony, the antimony might have been taken by her accidentally.

His Lordship, in summing up the evidence, stated that if the jury believed that the prisoner had administered the poison of antimony knowingly with the intention of killing the deceased, and if they believed that her death was accelerated by that antimony, that was the crime of murder. Such being the charge against the the prisoner, they ought to guard themselves from being affected by prejudice in the case. The question, therefore, was whether the evidence brought to their minds beyond all reasonable doubt that the prisoner, and the prisoner alone, administered antimony to this woman to cause her death, and that it so operated on her that a disease under which she was suffering was so aggravated by it, that it led to her death.

The jury almost immediately returned a verdict of *Not Guilty*.

DEATH FROM AN OVERDOSE OF PRUSSIC ACID.

Lewes, July 24th.

(Before Lord Chief Justice Cockburn.)

This was the case of a young man, George Bull, who had been brought up to the medical profession, but was not in regular practice; and the charge against him was that through negligence and carelessness he had caused the death of his mother, a lady aged 66, by the administration of prussic acid.

Mr. Barrow conducted the prosecution. Mr. Serjeant Ballantine and Mr. Marshall appeared for the prisoner.

It was not contended on the part of the prosecution that the prisoner had the slightest intention of causing the death of his mother, to whom he was warmly attached, but that from carelessness he had, in the eye of the law, rendered himself amenable to the charge of manslaughter. It was proved in evidence that the deceased was in ill health, and was subject to attacks of violent sickness and spasms of the stomach; and the prisoner attended upon his mother for these ailments, and was in the habit of prescribing for her small doses of prussic acid of Scheele's strength, which was attended with considerable relief. On Wednesday, July 11th, he procured from Mr. Roswell, a chemist at Lewes, one drachm of Scheele's prussic acid, of which the prisoner, in the early part of the day, administered to the deceased four minims, which gave relief, and in the evening she went out for a walk. On her return, she complained of being unwell, and the prisoner gave another dose of the acid; and the deceased had hardly time to go up to her bedroom, when she became insensible, and died almost immediately afterwards.

The evidence relating to the strength of the hydrocyanic acid, as well as that on the relation which "drops" bear to "minims," was so vague, that we give it in the words of the witnesses, as reported in the *Times*:—

Mr. G. Scrase, surgeon, of Lewes, deposed that he was sent for to the residence of the deceased on the evening in question, and when he arrived she was in a lifeless state, supported on one side by her daughter and on the other by her servant, and the prisoner was standing by apparently in a very distressed state of mind. Witness asked what was the matter, and he said that he had given his mother seven drops of prussic acid, and witness replied that he thought he must have given her more.

The Lord Chief Justice inquired of the witness whether seven drops would be sufficient to cause death?

The witness said that according to his experience it would not, and that it was the proper quantity to be administered. The smallest quantity of prussic acid on record as having caused death was nine-tenths of a grain.

The Lord Chief Justice inquired what quantity of minims a drop would contain?

The witness said that would depend upon the manner in which the drop was obtained from the bottle. If the cork was partly in, the drop would be larger than if it was poured out carefully from the open neck of the bottle. Some medical men made use of one method, and others the other; but it was his own practice not to rely upon "drops," but to measure the minims.

By Mr. Barrow.—With such a deadly matter as prussic acid, he should say that it certainly was not prudent for any medical man to rely upon the "drops," and that he ought to measure it. The proper doses, as marked upon all the bottles of prussic acid of Scheele's strength to be administered were one, two, or at the largest three minims. Scheele's acid was not uniform in strength; sometimes it contained four per cent. of acid, sometimes five, and sometimes as much as six per cent.

The Lord Chief Justice.—Would not that amount to almost just the difference between life and death?

Witness.—It would make a very great difference certainly; and Dr. Taylor and other eminent medical men have recommended that Scheele's acid should not be made use of on account of the very great variation that exists in its strength. I myself always use the acid of the Pharmacopœia, but, notwithstanding what has

been written upon the subject by many eminent medical writers, Scheele's acid is generally made use of by the profession.

The Lord Chief Justice.—Supposing this acid to be of the highest strength you have mentioned, do you consider that seven drops would have been sufficient to cause death?

Witness.—I do not believe they would.

By Mr. Barrow.—Six per cent. is an exceptional strength, but I should think it would take 17 minims even of that strength to cause death.

The Lord Chief Justice.—What do you say is the difference between a "minim" and a "drop?"

Witness.—That would depend upon the sort of "drop." The witness then stated that the prisoner afterwards gave him a bottle which contained prussic acid. He told him that he had given his mother four minims in the morning, and twenty-five minims remained in the bottle. He did not test the strength of the portion that remained, and he had no doubt that the deceased died from the effects of prussic acid.

By Mr. Serjeant Ballantine.—There was a broken cork in the bottle when the prisoner gave it to him. In his opinion seventeen minims of prussic acid was the smallest quantity that would destroy life. It was very easy to make a mistake while "dropping" liquid from a bottle. When the prisoner told him that he had given the deceased seven drops, he understood him to mean that he had administered a dose to the extent of three and a half minims. He had never heard of any instance where Scheele's acid had exceeded six per cent. in strength.

Mr. E. H. Roswell, a chemist at Lewes, deposed that on the 11th of July the prisoner came to his shop and asked for some prussic acid, and he gave him a drachm. The drachm would contain sixty minims. He did not measure it, but gave what he considered to be one-fourth part of the bottle.

Mr. Serjeant Ballantine.—As you say you did not measure it, can you tell us how much prussic acid you really did give to this gentleman?

Witness.—I cannot say to a drop. I am sure he had fifty drops. I consider a "drop" and a "minim" synonymous terms. I gave the prisoner about the quantity, but when prussic acid is dispensed by a medical man, he is, of course, careful as to the quantity he uses.

The Lord Chief Justice.—We have been told that a "drop" contains two minims, and this witness says he looks upon the two terms as synonymous.

Mr. Serjeant Ballantine (to the witness).—If you were told to give a patient so many "minims," should you give him so many "drops?"

Witness.—Certainly not.

Mr. Serjeant Ballantine.—Can you tell us the strength of the acid you sold?

Witness.—I don't know what strength it was. I should think about four per cent.

Mr. Serjeant Ballantine.—I am much obliged to you for your candid answers in reference to such an article as prussic acid.

This was the case for the prosecution.

Mr. Serjeant Ballantine then addressed the jury for the prisoner, after which

The Lord Chief Justice summed up, and having explained the law in reference to the case, drew the attention of the jury to the fact of the cork being broken and defective, which was an important matter for their consideration, as the acid might have escaped from the bottle accidentally, in which case there would be an utter absence of evidence that an excessive dose had been administered by the prisoner.

The jury almost immediately returned a verdict of "Not Guilty."

In the House of Lords, on Tuesday, Aug. 7th, the Earl of Harrington gave notice that on Monday, Aug. 13th, he should move for a report of the proceedings at the coroner's inquest on Mrs. Bull, who was said to have been poisoned by her son, George Bull, while he was in a state of intoxication.

The course adopted by the noble Earl was deprecated by the Lord Chancellor, and Lord Granville, on the part of the Government, declined to accede to the motion.

BOOKS RECEIVED.

THE POCKET FORMULARY, AND SYNOPSIS OF THE BRITISH AND FOREIGN PHARMACOPŒIAS; *comprising Standard and Approved Formulæ for the Preparations and Compounds Employed in Medical Practice.* By HENRY BEASLEY. (Seventh Edition.) London: John Churchill, New Burlington Street. 1860. 8vo, pp. 546. (From the Publisher.)

THE HALF-YEARLY ABSTRACT OF THE MEDICAL SCIENCES. Edited by W. H. RANKING, M.D., &c., and C. B. RADCLIFFE, M.D., &c. January—June, 1860. London: John Churchill, New Burlington Street. Edinburgh: Maclachlan and Co. Dublin: Fannin and Co.

ON THE INVENTION OF STEREOSCOPIC GLASSES FOR SINGLE PICTURES; *with Preliminary Observations on the Stereoscope, and on the Physiology of Stereoscopic Vision.* By T. WHARTON JONES, F.R.S., &c. London: John Churchill, New Burlington Street. 1860. (From the Author.)

TO CORRESPONDENTS.

Adulteration of Food and Drink Bill.—This Bill has now become law, having received the Royal assent on Monday, August 6th.

S. S. (Nice).—The article was unavoidably omitted in our number for July, but appeared in the following number.

A Subscriber (Norwich).—(1.) Methylated spirit can only be sold by persons authorized by the Board of Inland Revenue, and in quantities of not less than ten gallons. (2.) *Detection of Alum in Bread.* Vol. xvii., page 237.

S. D. (London).—*Manufacture of Lucifer Matches.* See vol. vii., page 522; vol. xii., page 101; and vol. i. (second series), page 358.

W. T. R. F. (Morpeth).—*Liquid Cochineal.* Vol. ix., page 443.

J. H. P. (March).—In the formula referred to, if the extract of henbane be slightly hardened, the addition of any powder is unnecessary.

G. W. J. (Clifton).—The powder sent for examination consists principally of phosphate and carbonate of lime.

A Constant Reader (Bridlington) is informed that he may obtain a copy of Ede's *Practical Facts in Chemistry*, by forwarding thirty-six postage stamps to Mr. T. G. Barrett, Ilchester.

Junius.—Hair Dye. Vol. xv., p. 144.

J. S. (Manchester).—(1.) Apply to Mr. W. Wilkinson, Cheetham Hill, Manchester. (2.) A general knowledge of the Latin language is necessary.

M. P. S. (Ripley).—A microscope, with additional apparatus sufficient for the purpose indicated, may be obtained of Messrs. Smith and Beck, Coleman Street, London.

A Registered Apprentice (Chatham).—*Colours for Shop Windows.* Vol. x., p. 92.

S. W. W. (Tenterden).—The extract should be first rubbed down with a little water, before adding the other ingredients; but a separation will take place.

A Junior Assistant (Leeds) wishes for a formula for Syrup of Sumbul.

J. W. (Brighton).—Socotrine Aloes.

Messrs. A. W. Digby and Co., 90, Chancery Lane, state that they shall be happy to receive any communications or suggestions relative to the *Pharmaceutical Almanac for* 1861 during the next month.

CORRIGENDUM.—Page 112, line 7, *for* extremely absurd, *read* extremely uncertain.

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, ELIAS BREMRIDGE, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. CHURCHILL, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.

SECOND SERIES.

VOL. II.—No. IV.—OCTOBER 1st, 1860.

ON THE INTRODUCTION OF THE CINCHONA TREES INTO INDIA.

For some years past, great anxiety has been experienced in this country and other parts of Europe, in consequence of the enormous demand for Cinchona barks, and the increasing difficulty of supplying that demand. It was feared, from the little consideration shown by the natives of the bark districts of Peru and Bolivia in felling the trees without taking any measures to plant others to supply the place of those thus destroyed by them, that a time must arrive, and that at no very distant period, when the supply of Cinchona bark would altogether fail. Hence, it became very desirable that the European Governments possessing colonies with climates adapted for the growth of the Cinchonas, should endeavour to obtain supplies of seeds and plants of the best species, and establish them in their own possessions.

Some years since, Dr. Weddell, a most experienced botanist and enterprising traveller, proceeded to the Cinchona districts, and succeeded, by means of great energy and hardihood, in elucidating much that had been hitherto obscure as to the botanical origin of many of the barks in common use in Europe. At the same time he succeeded in obtaining some seeds, which he brought to Paris in 1848. From these seeds plants were afterwards raised, both in Paris and at the Horticultural Society's garden at Chiswick, but no attempt, to any extent at least, was made by Dr. Weddell or the French Government to acclimatize the Cinchonas in any part of the French possessions.

A few years after Dr. Weddell's return to Europe, the attention of the Dutch Government was directed to this important subject, and M. Pahud, the governor of the Dutch East Indies, sent a very intelligent gardener, M. Hasskarl, to Peru and Bolivia, for the express purpose of obtaining a supply of plants and seeds of the Cinchonas, for transportation to the Island of Java, where it was believed that a favourable soil and climate might be found for their successful growth. After a residence of two years and a half in Peru, M. Hasskarl succeeded (through the agency, it is said, of one Henriquez, who was imprisoned in Bolivia for having supplied him) in procuring about 400 plants of Cinchona Calisaya in a flourishing condition. These were forwarded from the port of Islay to Java, where they arrived safely in 1853, and were at once planted in the mountainous districts near Bandong in that island. By referring to a note "Cultivation of the Cinchona Trees in Java" in the present number of this Journal, it will be seen that the plants have now become firmly established there, and already begin to yield bark of good quality. (See page 220.) This expedition of Hasskarl's, therefore, must be regarded as having been eminently successful in every respect, and to the Dutch Government accordingly belongs the merit of having been the first to succeed, on a large scale, in acclimatizing the Cinchonas.

These successful expeditions of the French and Dutch would appear to have forced the attention of the English East India Company to the importance of obtaining plants and seeds of the best species of Cinchona for transportation to India, where such could, without doubt, be readily acclimatized over extensive

areas. Dr. Royle's death, and the uncertainty attending even the existence of the Company, appear to have been the principal reasons why an expedition for such a purpose was not at once despatched from this country. Ultimately, however, in 1859, Mr. Clements R. Markham, one of the clerks in the India office, was appointed to direct such an expedition, and that gentleman also procured the services of Mr. Weir, a gardener, to assist him in his labours.

In noticing Mr. Markham's appointment to our readers in the *Pharmaceutical Journal* last year, we stated that he had been selected for that office principally on account of his knowledge of the country to be visited, and of his acquaintance with the Spanish and the language of the Indians inhabiting it. Mr. Markham was also admitted to be a gentleman possessing much courage and energy of character. With such qualifications, if combined, we said, with a competent knowledge of botany, he could scarcely fail in being successful in his endeavours. Mr. Markham, however, made no claim to be considered as a botanist or scientific man, and considering the importance of such a knowledge in the expedition in which he was about to be engaged, it certainly did strike us as somewhat remarkable that he should have been selected by the English Government as the most suitable man to take the command of such an undertaking. We do not, however, blame Mr. Markham in this matter, the responsibility of such an appointment rests entirely with the Government who commissioned him. Moreover, after his appointment, Mr. Markham applied himself for some months before starting to qualify himself botanically for the work in which he was about to be engaged. With a knowledge of all these facts before us, we had great hopes that the expedition would prove in some degree at least successful, notwithstanding the admitted deficiency of Mr. Markham's botanical knowledge and skill, and in this we have not been disappointed, as will presently appear.

After a time, Mr. Markham, accompanied by Mr. Weir, proceeded on his journey, and returned from thence in June last, when he reported its result to the India Board. The following notice of this report, and extracts therefrom, are derived from the *Gardeners' Chronicle* of August the 11th, and will supply our readers with a short summary of the route taken by Messrs. Markham and Weir, and of some of the difficulties and dangers they had to contend with :—

On the 12th March of the present year Mr. Markham left Arequipa, a town in Southern Peru, with Mr. Weir, a gardener, and travelling inland arrived at the city of Puño, on the banks of Lake Titicaca, on the 27th, a very painful journey, over snowy heights 15,500 feet above the level of the sea, in the worst season of the year, the rigours of which were increased by the debility brought on by an illness from which he had suffered at Arequipa, and by the *sorochi*, or violent headaches and sickness, occasioned by the great elevation of this region above the sea. The loftiest part of the road is several hundred feet above Mont Blanc. This route was taken with a view to entering from the north the republic of Bolivia, the head-quarters of that sort of Cinchona called Calisaya; a project which was prevented by weather and the unsettled state of the country. Moreover, he heard that the Government and people were so jealous of preserving a monopoly of the bark trade as to render it impossible for him to make a collection personally. These obstacles, be it observed, were no hindrance to either Weddell or Hasskarl. Foiled in his attempt to get into Bolivia, Mr. Markham struck across the country to a place called Sandia, on the eastern slope of the Cordillera, within the Peruvian frontier, which seems to have been his temporary head-quarters. Of the *agrémens* of his journey we have such accounts as the following:—

"On the road from Puño to Caravaya there were four broad and very rapid rivers to cross on *balsas*, or long bundles of reed stitched together, while the mules swam. The plains and mountain ranges over which the way passed averaged a height of 12,000 to 13,000 feet above the level of the sea, and one snowy pass attained a height of nearly 17,000 feet. The season was one of violent storms, with hail and snow and constant rains.

"Beyond the river Challuma, a tributary of the Tambopata, and the extreme point reached by Dr. Weddell, there is no path of any kind, the trees are of great height, and the ground is entirely choked up with creepers, fallen masses of trees and bushes, and tangled bamboos. In many places, the way led along the verge of a precipice overhanging the river, which boiled and surged many hundreds of feet below. Our encampments were made each night on any stony beach we could find where there was space to light a fire and pitch the tent, and all day we toiled and struggled through the closely-woven jungle.

"On the 4th, I made a toilsome and dangerous forest journey, along the most giddy precipices, overhanging the river, with no foothold but decaying leaves, nothing to grasp but rotten branches, every motion a drenching bath from the wet branches, every other step a painful and dangerous slip or fall.

"Since leaving Sandia on April 24th up to May 15th we had walked over 174 miles, which may not, at first sight, appear very much; but when it is considered that it was chiefly not walking, but scrambling on hands and knees up precipices or through dense forests, and that there was not one day given up to rest, while the supply of food was exceedingly small and precarious, I think it will be considered tolerably good work.

"On the 17th of May, I left Sandia, with one Indian and two mules carrying the plants, and halted under a splendid range of frowning black cliffs, near the summit of the snowy Caravaya range. On the 18th I reached the summit of the range, and commenced the journey over vast grass-covered plains covered with stiff white frost. After being 11 hours in the saddle, I stopped at an abandoned shepherd's hut built of loose stones. The plants, well covered with the tent and blankets, were placed by my side during the night with the thermometer between us, which, at 6 A.M., was at 20°. The days and nights bitterly cold, but very fine, and generally cloudless. On the 19th I was 10 hours in the saddle, and passed the night again in an abandoned hut with the plants beside me, where the minimum of the thermometer was 30°. Two more journeys of similar length, when the minimum during the night of the 21st was 21°, and of the 22nd 16°, brought me to Vilque, where I procured an arriero and mules to convey me to Arequipa. The sufferings during my six days' journey over the lofty plains from Sandia to Vilque were very great. The cold was intense, the work I had with the vicious, unmanageable mules was a constant source of anxiety, and I had no food whatever beyond a little parched maize. Each day I was upwards of 10 hours in the saddle."

It will be seen by the above extracts from Mr. Markham's report, that he had to contend with great difficulties and dangers in his journey, and that he surmounted them with much energy and courage. Every one must admit the truth of this. Ultimately, he succeeded in obtaining, and conveying to Islay, 529 plants of Cinchonas, chiefly, he states, of that species called Calisaya. Of these plants, however, 73 perished by cold, or were broken, or otherwise injured in their passage across the region of the Andes; and when we consider the intense cold of that region, the extent of country through which the plants were conveyed (upwards of 300 miles), and the otherwise difficult nature of the district traversed, this must be regarded as a very fair result. The remaining 456 plants were forwarded in Wardian cases to this country. These cases reached Southampton in safety, and it is stated that 216 plants had, on their arrival, already begun to throw out shoots, while 60 more were still alive. The remaining 180 plants we suppose perished on their way from Islay to Southampton; and when we inform our readers that the cases of plants, instead of being carried directly from Islay by a steamer to India, which would have been by far the best mode of transit, were taken first to Panama, and then across the Isthmus, and then by way of the West Indies to England, we can only express our surprise that so many plants survived the dangers of the journey and the vicissitudes of climate, &c., to which they were exposed by such an indirect route.

The plants are now on their way to India, where, should they arrive in a suitable condition, they will, we believe, be planted in the Neilgherry Hills,

as this district is considered to be a very favourable one for the growth of the Cinchonas. Mr. Markham has also proceeded to India for the purpose of superintending the plants in their transit, and subsequent establishment. He proposes to return to this country next spring, to which period he has deferred the publication of his observations upon the Cinchona regions which he traversed, and all other particulars respecting the expedition in which he has been engaged.

No seeds were obtained by Mr. Markham in the late expedition, as the season for collecting them had not arrived when he was in the bark country. Before leaving South America, however, he commissioned a Mr. Pritchett to look out for seeds for him in the more northern bark districts, and forward such to him; these he hoped would reach him by the present month.

Such being the result of Mr. Markham's expedition, upon a full and impartial consideration of it in all its bearings, we cannot agree in the opinion which has been expressed in some quarters,—that it has proved almost a failure, that is, taking for granted that the plants obtained are chiefly those of the true Calisaya, which Mr. Markham states to be the case, and of the correctness of which we have no means of judging, and have no right, therefore, to call in question.

Some errors of judgment were, no doubt, committed in the late expedition; thus, we believe (and in this belief we know that we are supported by some eminent authorities), that it would have been better if Mr. Markham, instead of endeavouring at the commencement of his journey to penetrate into Bolivia, the bark districts of which are jealously guarded by the Government, had at first explored other more accessible regions farther north, and then, after having succeeded in obtaining supplies of plants or seeds, or both, from such regions, and forwarded them to a safe spot, or at once home, he could have attempted to make his way into Bolivia to the head-quarters of the Calisayan district. By such a course of proceeding, Mr. Markham, would, we think, have saved himself much unnecessary fatigue and danger, and would have succeeded more completely in his expedition. Should Mr. Markham, however, have taken his late route in the direction he pursued by the advice of Dr. Weddell, which we have heard was the case, it must be admitted that he could not have gone to higher quarters for advice, and acting on such suggestions, no blame can attach to him.

The greatest mistake of the expedition, however, was undoubtedly that of the English Government, and for which Mr. Markham was not responsible. This was, in not directly chartering a steamer from Islay across the Pacific to India for the conveyance of the plants collected, instead of forwarding them at first to Panama, thence across the Isthmus, and then by way of the West Indies to Southampton, then, after allowing them to remain there for some time, to ship them to Egypt, to be from thence conveyed across the burning regions of the Desert and the Red Sea, &c., to one of the ports on the western shores of India. Whatever success might have attended Mr. Markham's labours, such could not but be seriously imperilled by adopting such an indirect and dangerous route for the transportation of the plants.

We trust, however, that notwithstanding all the difficulties and dangers to which the Cinchona plants have been, and will be, exposed, that Mr. Markham may ultimately be rewarded for his exertions, and the trials which he has undergone; and that in a few years we shall find the Cinchonas thoroughly established over several extensive regions in India, so that we need no longer have to look forward with any apprehension to the day when our supplies of Cinchona bark from South America must cease. We wish every success to Mr. Markham in his present journey to India, and shall be glad to have a favourable report of his final exertions upon his return to England.

OUR EVENING MEETINGS. No. III.

> "All is the gift of Industry, whate'er
> Exalts, embellishes, and renders life
> Delightful."

Another year has passed away, and how quickly, since I last touched upon a subject which I have always regarded as one of the pillars, as also one of the chief and most interesting features, of the Pharmaceutical Society,—I mean the Monthly Evening Meetings. At the commencement of another session, I desire to add a word or two more to what I have already written. With the exception of the Annual Meetings, the Conversazione, or some special assembling together for a specific purpose, the Evening Meetings are the only occasions upon which the Members and Associates have the opportunity of meeting and becoming better acquainted with each other as Pharmaceutists and Chemists, and such meetings do tend and have tended to a better knowledge and appreciation of the body, not only and simply as individuals, but also as an educated and influential class of society. Upon these occasions there is also the pleasure of meeting those members of the medical profession who have often given us the benefit of their valuable experience and knowledge, with the results of their scientific researches and inquiries; this alone should be no small inducement for us to attend and bring all our strength to render these evening meetings worthy of the Society, and cause them to be regarded with attention and interest. Again, they are a link and bond of union between the town and country Members, and although it has sometimes been urged that the gain is mostly on one side, if looked into closely, it reminds me of the fable of the town and country ox:—The country ox complained to his brother in town that he was hard worked in the fields all day, and but indifferently fed, and badly sheltered at night from the cold and cutting winds, whilst he of the town was well fed and warmly sheltered, and visited and admired on account of his good condition. "It is true, too true," replied he of the town; "I am well treated surely, but only to make me better fitted for an early slaughter." And thus it is every position has, more or less, its advantages and its drawbacks.

There are those who would throw cold water upon these evening meetings, whose perpetual *cui bono?* would damp the ardour of a Hercules himself, and who see no good in them, because they say the information gained does not prove a palpable and tangible source of profit. The best, or apparently the best, reply to such, is the undeniable fact that everything connected with these meetings is sought for and published by other journalists. Let the disappointed turn the current of the stream as it flows at present, and by papers and communications of their own, kindly and gently lead us to that path which they conceive would open to wealth and prosperity.

In the approaching session there will be a new and larger room for our evening meetings, and possibly there may be some ambition abroad as to who shall have the honour of reading therein the first original paper. Let the greater honour appear in establishing and maintaining a good supply, in increasing the number of visitors, and perpetuating it.

In looking over the papers of the past year, it is a pleasure to remark that the greater proportion have emanated from the younger Members and Associates. So far this is encouraging and promises well; for, however agreeable and valuable we may feel it to be to sit and listen to the matured reasoning and skilful conclusions of our senior Members, it is from the rank and file that our strength must be rendered continuous and self-supporting. Therefore would I urge upon the young to continue in their career with earnestness and sincerity, never losing sight of the fact that the parent building must be by them supported. As a watch in the dead of night, when all nature rests, unceasingly and unerringly marks each fleeting hour, so surely, in all human probability,

will study, industry, determination, and perseverance lead eventually to prosperity and success.

But little else have I to suggest at present; yet there still appears one inducement more. As the youngest soldier in the French army sees the marshal's *bâton* looming in the future, and may obtain it, so may the youngest student reach the President's chair—an honour even in the infancy of the Society; how much more so as it progresses, adding to its number of scientific and useful Members, and obtaining a world-wide reputation as an institution, for the perfectness of its Laboratory and Museum, the extent and usefulness of its Library, and the efficiency of its School of Pharmacy, Chemistry, and Botany.

18, *Conduit Street*, 11*th Sept.*, 1860. A. F. Haselden.

THE EXCISE LABORATORY IN SOMERSET HOUSE.

For several years the Commissioners of Inland Revenue have afforded to a certain number of their Excise officers, selected for that purpose, the means of acquiring instruction in Chemistry, with a view to its application for the detection of adulterations in excisable articles, or frauds upon the revenue. This system of training up Excise Chemists was, we believe, commenced when the late Mr. Fownes was professor in the Birkbeck Laboratory at University College, and from that time to the present about eighty young men from the Inland Revenue Department have received a chemical education in the above school at the cost of the Government. Some of these have become valuable officers, and much advantage is considered to have resulted to the public service from the introduction of a knowledge of Chemistry among those engaged in duties connected with the Excise. The young men thus educated become valuable assistants to Mr. Phillips, who is at the head of the Chemical Department of the Inland Revenue. About a year ago a new laboratory having been fitted up for Mr. Phillips at Somerset House, arrangements were made for giving the instruction to the students there which had previously been sought elsewhere. The Commissioners, in their last report, make the following allusion to this change:—

"The change which we made in the last year in the system of instructing a certain number of our excise officers in Chemistry appears likely to be very satisfactory in its results.

"Your Lordships are well aware of the great advantage derived for many years past from our having secured to ourselves the means of detecting adulterations in articles subject to the duties of Customs and Excise by officers so carefully imbued with the necessary scientific knowledge that we could safely rely upon their conclusions. Up to last year, these officers received their instruction at the University College at an annual cost of about £800. Now, however, that our chemical department at this office is so efficient, and that the laboratory is so spacious and complete, we consider that the training of our chemical students can be more effectually and more economically conducted under the superintendence of Mr. Phillips. We have entire confidence in his ability for this undertaking; but in order that we may have the most satisfactory evidence of the acquirements of his pupils on the completion of their course, we have made it a rule that they shall then be examined by some eminent Chemist unconnected with this department. Nine officers were accordingly selected in the early part of the year 1859 to attend in the laboratory, and when the time arrived for their examination we were so fortunate as to induce Dr. Hofmann to undertake the task.

"It is impossible to speak too highly of the pains which that distinguished professor bestowed upon the investigation of the knowledge and abilities of each of the students; and it was very gratifying to us that, after classifying them in order

of merit, and pointing out that some of them had displayed a degree of proficiency which had surprised him, he was able to speak in the most favourable terms of the system of instruction which they had undergone."

The following is the

REPORT ON THE LABORATORY, BY MR. PHILLIPS.

THE laboratory has now been eighteen years in operation, and it has long been its duty to investigate, when required, any subject affecting the revenue which involved the application of chemistry or the microscope. Within the last seventeen months it has received a large accession of business, which has necessitated several important alterations in its management and arrangements.

When in 1858 the Board resolved to give a certain number of officers a chemical education in their own laboratory, instead of sending them, as formerly, to University College, London, I felt a deep sense of the responsibility which thus devolved upon me; and this feeling was not lessened by the fact that the apartments in which the business of my department was then temporarily carried on were totally unfit for educational purposes. In October, 1858, nine officers commenced a systematic course of chemical instruction under my superintendence, and until June, 1859, when the laboratory was removed to its present commodious rooms in Somerset House, their progress was, to a considerable extent, retarded by the want of accommodation adverted to. Considering this disadvantage, and likewise a far greater, but also remediable one, arising from a want of experience in imparting instruction, I am naturally much gratified at the result of the severe and impartial examination to which the students were subjected in December last. This satisfactory result is highly commendatory to the students, and renders it unnecessary for me to add one word in their praise.

The number of samples analyzed in the practical branch of my department during the year just ended, amounts to 9631, being 2865 more than the number examined in 1858. These figures, large as they are, give but a very imperfect idea of the amount of work performed, which, during the period to which the report relates, has involved not less than 5000 distillations, and nearly 16,000 weighings; whilst the number of papers which have, within the same period, passed through the department, and been reported upon, is upwards of 7000. As the work of the laboratory increased, it became necessary to increase the accommodation, and to systematize and simplify as far as possible the regulations under which the business of the department was conducted. The former of these objects has been sufficiently attained by the removal of the laboratory to its present rooms, which have been most efficiently arranged and fitted up with special regard to the purposes to which they are now applied. Until recently, the particulars relating to each sample, the results of the analyses, and the registration for easy reference of the whole work of the department, were entered in books of plain paper, thus causing besides a loss of neatness and uniformity, a very large amount of avoidable labour in ruling and titling. This defect is now remedied, the various books are well kept, and the assistants have more time to devote to other duties.

Since the date of my last report 24 examiners have been instructed in the laboratory, making a total of 85 who have thus had the opportunity of becoming acquainted with scientific modes of detecting adulteration. Of this number about 60 are now supervisors, and as many of them, by the purchase of expensive microscopes, have evinced a real interest in the study of the various features of adulteration, it may not be unfairly assumed that beneficial results will be derived from the system of teaching in question. That benefit has already accrued to the revenue may be shown by mentioning one case in which, during the past year, a supervisor in the provinces, who possessed a microscope, applied it to some of the articles sold by the traders under his survey; the result being that a wholesale fraud both upon the revenue and the consumers of a certain article was discovered in London, and the persons implicated punished.

In my report for the year 1858, I referred to the experiments which were being made in the laboratory for the purpose of eliciting data upon which instruments and tables might be constructed for ascertaining the strength of spirits possessing an

alcoholic value beyond that of the strongest spirits to which Sike's hydrometer and tables are applicable. The completion of these experiments has been unavoidably delayed owing to the mildness of the last two winters, and it has been only since the commencement of the present year that the weather has been cold enough for a sufficient period to enable me to obtain the whole of the experimental data required. The investigation has been one of extreme difficulty, but I believe its results will be found trustworthy and valuable, as they have placed in our possession means hitherto wanting, by which the strongest spirit even to absolute alcohol can be assayed at any temperature between 40° and 85° F. The formation of tables from the data obtained yet remains to be done, and as this will involve much careful calculation of a somewhat intricate nature, a considerable period must necessarily elapse before the object in view is fully attained.

TOBACCO.

The practice of examining the tobacco manufactories of the country has been continued during the year, a great number of them having been unexpectedly visited by myself, and a few by some of my assistants. In addition to this, experienced officers, who have been educated in the laboratory, and who are stationed in those towns where the manufacture of the article is carried on to a large extent, such as Liverpool and Bristol, are enjoined strictly to examine at uncertain times the operations and stocks of the manufacturers. From my own extensive observations, and the concurrent testimony of these officers, I have no hesitation in saying that the adulteration of tobacco is now but seldom attempted. That an article, which from the high duty upon it, the keen competition existing among its manufacturers, and its almost universal consumption, offers stronger incentives to its sophistication than perhaps any other commodity, should generally be sold in a pure state, fairly shows that its freedom from adulteration is due partially, if not mainly, to that strict supervision of its manufacture which has for years been exercised by the revenue.

Of the large number of samples of tobacco examined on the premises of the manufacturers within the past year, it has been necessary to select only 57 for analysis; and of these 16 only were adulterated. One sample was of the description known as "Roll," and consisted chiefly of cabbage-leaves, the outside covering only of the roll being tobacco.

Table showing the number of Samples of Tobacco analysed in the Laboratory, in the years 1857, 1858, *and* 1859.

Years.	Number of Samples.			Per-centage of samples adulterated.
	Genuine.	Adulterated.	Total.	
England	33	12	45	26.6
Scotland	2	—	2	—
Ireland	6	4	10	40.0
Total in 1859	41	16	57	28.0
" 1858	54	19	73	26.0
" 1857	16	30	46	65.2

The following ingredients were found in the adulterated samples:—sugar, liquorice, oil, and carbonaceous matter, cabbage-leaves, nitrate of potash, sulphate of magnesia, common salt, ammonia-alum, and carbonate of lime.

SNUFF.

Up to 1856, the practice of adulterating snuff was very prevalent, particularly in Ireland, no less than 52 per cent. of the samples examined in that year being illicit. In 1858, the corresponding per-centage was 7, and in the year now ended 9.

The partial abandonment, thus indicated, of the fraudulent practice is the more satisfactory when it is considered that snuff, unlike tobacco, can be easily sophisti-

cated by the person who retails it, and that too to a large extent without exciting the suspicion of the purchaser, the appearance and pungency of the article being so little changed or impaired by the introduction of illicit ingredients that, in most cases, the fraud can be detected only by experienced persons with the aid of the microscope.

In the manufacture of snuff known as "Irish" and "Welsh," the law permits the use of *lime water;* and some manufacturers have been in the habit of abusing this permission by using, not lime water alone, which is sufficient for the proper preparation of the snuff, but a thick mixture of that fluid and powdered lime, to an extent constituting an adulteration in its worst form, being physically injurious to the consumer, as well as a serious fraud on the revenue. It is not easy to suppress this practice, from the fact that a certain but undefined amount of lime is necessary in the manufacture of the snuffs in question; it being consequently difficult to obtain a conviction upon an analysis of the finished article. Within the past year, however, two manufacturers have been detected in the act of adding large quantities of a thick mixture of lime and water to the tobacco-stalks in process of being made into snuff, and have paid penalties in consequence, besides forfeiting the adulterated materials.

Whilst in 1856 it was found necessary to analyse in the laboratory 209 samples, of which 110 were adulterated, in the past year it has been deemed requisite to select only 11 samples for that purpose, and of these 10 proved to be genuine.

Samples of Snuff analyzed.

Years.	Number of Samples.			Per-centage of samples adulterated.
	Genuine.	Adulterated.	Total.	
1857	35	9	44	20.4
1858	92	7	99	7.1
1859	10	1	11	9.1

The adulterated sample was from Ireland, and contained roasted oatmeal.

PEPPER.

The experience of the past year has fully borne out the opinion I expressed in my last report, that pepper was not so much sophisticated by retailers as by grinders of, and wholesale dealers in, the article. In 1859, the discovery of some adulterated pepper in the possession of a retailer in the country led to the seizure of a large quantity of similarly adulterated pepper from the warehouse of a firm of wholesale dealers in London, and immediately afterwards a further seizure was made on the premises of another firm that had ground the commodity. Both these firms were prosecuted to conviction, and paid heavy penalties. The illicit material used in this case was sago flour, and it was stated, in extenuation of the offence, that the pepper seized was of fine quality, and that by mixing it with a certain per-centage of some cheap and innocuous substance, such as sago flour, the public was served with a better article than could be obtained for the same money when genuine pepper was purchased. Besides the above, several detections have been recently made, the prosecutions relating to which are depending.

It is more than probable that the wholesale dealers who adulterate their pepper resort to the practice, not with a view to obtain a large per-centage profit, but that they may be enabled to extend their business by underselling those of their competitors who deal only in the genuine article.

From the results obtained in the laboratory during the year just ended, it appears that the practice of adulterating pepper is not only very general, but that it is increasing; for whilst, in 1856, out of 95 samples analyzed only 27 were found to be adulterated, in the past year, of 99 samples examined as many as 78 were illicit.

Samples of Pepper analyzed.

Years.	Number of Samples.			Per-centage of samples adulterated.
	Genuine.	Adulterated.	Total.	
1857	15	13	28	46.4
1858	29	27	56	48.2
1859	21	78	99	78.7

The adulterating ingredients found in the samples examined within the last year are the husks of red mustard, white mustard, and rape seeds, sago, and cereal starches, and powdered slate. Beside these, many of the samples contained capsicum, long pepper, and a very large and undue proportion of the stalks and husks of pepper.

COFFEE.

Whilst it is strictly forbidden that tobacco, tea, pepper, and other articles subject to fiscal duties should be sold except in a state of purity, or at least as imported and passed by the Customs, coffee has for many years been permitted, under certain regulations, to be sold mixed with a substance, chicory, which affords a beverage somewhat resembling, but inferior to, that derived from coffee—yields but little return to the revenue—and is not worth one-third of the article it supplants. Under these circumstances, brought about partly by the representations and efforts of the dealers in ground coffee, and partly by the fact that a taste for the mixture had been gradually acquired by a section of the community, it obviously became necessary to adopt measures to protect the revenue, and to prevent that portion of the public which preferred purchasing pure coffee from being imposed upon, under cover of the indulgence allowing mixtures of coffee and chicory to be sold. Accordingly, it has been the practice of the revenue to cause annually several thousands of samples to be purchased, indiscriminately, for analysis, from coffee dealers throughout the United Kingdom, and to institute proceedings against all persons found infringing the fiscal regulations which govern the sale of coffee. The mixing of coffee with chicory is as much an adulteration as the addition of sloe-leaves or tannin to tea, or of sugar to tobacco, under the plea that these articles would be thereby improved; and it may be a question whether the revenue and the public, and ultimately the dealers themselves, would not be benefited by prohibiting entirely the sale of mixtures of chicory and coffee, leaving the customers to purchase the two substances, and to mix them according to their own taste.

Samples of Coffee and Mixtures of Chicory and Coffee examined in the year 1859.

In what part of the United Kingdom purchased.	Samples purchased as Pure Coffee.					Samples purchased as mixtures of Chicory and Coffee.					
	Number genuine.	Number containing Chicory.	Total.	Per-centage of samples containing Chicory.	Average per-centage of Chicory in the samples.	Number properly labelled.	Number improperly labelled.	Number not labelled.	Total.	Per-centage of samples not labelled.	Average per-centage of Chicory in samples not labelled.
England.....	2475	59	2534	2.3	25.1	520	13	13	546	2.3	18.1
Scotland	276	21	297	7.0	25.9	49	—	4	53	7.5	29.0
Ireland	614	25	639	3.9	20.9	124	2	17	143	11.9	59.1
Total in year 1859 ...	3365	105	3470	3.0	24.2	693	15	34	742	4.5	39.8
" " 1857 ...	3395	110	3505	3.1	26.8	220	1	7	228	3.0	30.7
" " 1857 ...	4482	142	4624	3.0	22.2	281	17	17	315	5.3	26.7

It will be seen from the foregoing table that the per-centage of chicory present in mixtures of chicory and coffee sold unlabelled has risen from 26.7 in 1857 to 39.8 in the year just ended; the quantity of chicory contained in such mixtures sold in Ireland averaged not less than 59 per cent.

BEER AND HOPS.

In adulterating beer, the fraudulent brewer or retailer aims at increasing his profits by the adoption of one or both of two distinct methods, that is, either by simply increasing the bulk of his beer by the addition of some other liquid, or by rendering the beverage more intoxicating and thirst-exciting, giving to it, by the use of certain chemicals and drugs, a false appearance of strength, and a bitter not due to the hop. In the first method, which is the best adapted to the purpose of the dishonest retailer, the substances added to the beer are, usually, saccharine matter, water, and salt; whilst in the second method, which is oftener adopted by brewers than by retailers, the illicit materials most commonly resorted to are grains of paradise, and, as a substitute for hops, quassia, gentian, chiretta, and wormwood. It is supposed from the large quantity of cocculus indicus imported, for which no legitimate purpose can be assigned, that it is used in the adulteration of beer; but only one detection of the kind has been made within the last seven years.

In my former reports I alluded to the great difficulty in establishing conclusively, by chemical analysis, the fact that a sample of beer is adulterated. In some few cases this can be done, but although the analyst may often feel certain that a fraud has been committed, the proofs obtained are not sufficiently strong to satisfy a court of justice, or even to justify a prosecution. For the detection of many forms of adulteration no satisfactory process is known; the whole subject requires investigation; and I purpose, on the first opportunity, causing experiments to be made in the laboratory with a view to render more easy and certain the detection of illicit materials in beer.

Within the past year only three samples of beer—all of which proved to be genuine—were sent to the laboratory for analysis. During the same period six samples of spent hops were also examined, five of which were adulterated, three with grains of paradise alone, one with the addition of ground roasted chicory, and one with calamus aromaticus (sweet flag). Beside these a few samples of adulterating substances found on brewing premises have been analyzed.

ROASTED MALT.

The practice of roasting raw barley to the almost entire exclusion of malted grain, which was very general four years ago, is now, owing to the operation of the Act 19th and 20th Vict., c. 34, in a great measure suppressed, and it is satisfactory to be enabled to state, that although at one time the malt roasters in London carried on the obnoxious practice, in some cases to its utmost limit, being induced to do so in self-defence by the competition of fraudulent roasters in other parts of the country, they have, throughout the past year, been working fairly, and in no instance has it been necessary to institute proceedings against them. In Ireland, some roasters have persisted in mixing ungerminated grain with their malt; but even here some improvement has been perceptible, as the average per-centage of illegal grain present in the samples examined is considerably less than that found in the samples taken in 1858. The following table shows these per-centages for the last three years; the corresponding per-centage in 1856 was 71.6:—

	Number of samples examined in the laboratory.	Per-centage of samples illegal.	Mean per-centage of ungerminated grain in the samples.
From 1st April, 1859, to 31st March, 1860	143	81.8	13.7
From 1st January, 1858, to 31st March, 1859	59	74.5	17.4
Year 1857	221	88.2	28.1

BEER EXPORTED ON DRAWBACK.

The large quantity of beer exported during the year just ended, and the fact tha in all shipments, however small, the beer is now tested as to its strength, have caused that portion of the business of the laboratory which consists in determining original gravities to be nearly double what it was in the year 1858, the number of samples examined within the past year amounting to 4780, which number is increased to 4928 by experiments repeated, and the number of duplicate samples.

The truthfulness of the mode of ascertaining original gravities practised by the revenue is now but seldom disputed, and when such is the case it is generally found that those who demur have had but little experience in brewing beer for exportation, and consequently have not been in the habit of having the strength of their finished beers rigorously tested. The large brewers appear to admit that the mode in question is fair, and whilst some of them brew their beer so that the original gravity is only slightly greater than that at which it is declared on exportation, it very rarely occurs that their beer is disentitled to the drawback claimed.

WOOD NAPHTHA.

The fact that spirits of wine, when rendered non-potable by the addition of wood spirit, may be safely permitted to be used, duty free, in the arts and manufactures, appears to be well established; and I am not aware that any one has succeeded in obtaining a potable spirit from the mixture in question. Efforts have unquestionably been made to separate the two spirits, but not so much, I believe, to produce a drinkable spirit, as to obtain from methylated alcohol spirits of wine sufficiently pure for certain chemical and pharmaceutical operations for which the methylated spirit is not well adapted.

The wood naphtha used for methylating alcohol is always tested in the laboratory in order to determine whether or not it is suitable for this purpose, and in the year just ended 47 samples have been so examined.

MISCELLANEOUS SAMPLES.

The number of samples of a miscellaneous description analyzed in the laboratory during the last twelve months amounts to 75, of which 14 were from the Customs. They comprised foreign and British wines, cordials, imitation wines containing no alcohol, ginger beer, fruit essences, "finish," breakfast powders, cocoa, cane sugar, molasses, glucose, vegetable juice, syrups, teas, dyes, essential oils, and exotic flowers.

Total number of Samples analyzed in the Laboratory in each of the years 1857, 1858, *and* 1859.

Description of samples.	Number of samples examined in		
	1857.	1858.	1859.
Tobacco	46	73	57
Snuff	44	99	11
Pepper	28	56	99
Beer, and substances used in its adulteration	14	10	6
Hops which have been used by brewers	7	11	6
Tea	5	4	5
Coffee	4624	3505	3470
Coffee and Chicory	315	228	742
Malt	221	54	143
Beer (original gravities)	1049	2550	4928
Distillers' Wash	—	25	42
Wood Spirit	50	41	47
Miscellaneous samples	60	110	75
	6463	6766	9631

Laboratory, 31*st March*, 1860. (Signed) G. PHILLIPS.

REPORT OF THE RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION, AND OF THE APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

Ourari an Antidote to Strychnia.—The fact first demonstrated by M. Cl. Bernard, that the ourari poison possesses the property of paralyzing the motive nerves, has suggested to M. L. Vella its application to the treatment of tetanus as produced by strychnia.

M. Vella's experiments are of two kinds : first, those in which animals, poisoned by the introduction of strychnia into the stomach, received into the blood successive doses of ourari, in such a manner as to exactly subdue the manifestations of tetanic convulsions ; secondly, those in which a mixture of strychnia and ourari were injected into the blood of animals. In both cases the action of the strychnia was completely neutralized, and the animals escaped death. Two centigrammes of hydrochlorate of strychnia, dissolved in twenty grammes of water, were injected into the stomach of a dog weighing five kilogrammes and a half, and which had been fed twelve hours previously. Five minutes after the administration of the poison the tetanic convulsions appeared. A solution of ourari was injected into the jugular vein; the convulsions subsided, but reappeared in a few minutes. The injection was cautiously repeated, until a dose of three centigrammes of ourari dissolved in fifteen grammes of water had been given—the administration extending over a period of three hours. The animal experienced no more convulsions, and remained at liberty in the laboratory.

It should be stated that great caution is necessary, and that the injection must be made very slowly, lest the animal should succumb to the influence of the ourari. As the convulsions diminish in intensity, the injection must be stopped, and resumed again when the symptoms reappear.

Three days after, the animal had perfectly recovered; and was killed by the administration of the same quantity of strychnia without the intervention of ourari.

The same results were obtained in a more striking manner by the second method of making the experiment. Into the jugular vein of a dog weighing 8700 grammes was injected a mixture of two milligrammes of strychnia and fifteen milligrammes of ourari, dissolved in fifteen grammes of water. The animal ran about the laboratory without experiencing any inconvenience. No convulsions or extraordinary action of the muscles were experienced at any period. The same dose of strychnia administered eight hours after, under identically the same conditions, but without the ourari, produced death in ten minutes.

It follows from this experiment that two milligrammes of strychnia are neutralized by fifteen milligrammes of ourari. It might be inferred that these quantities might be proportionately augmented with impunity ; the author, however, states that there is a limit to this increase, but which he does not appear to have determined. M. Vella's object was simply to indicate that the tetanic and poisonous effects of strychnia may be neutralized physiologically by ourari.

On the Means of Detecting the Presence of Alcohol in Chloroform.—M. Lepage, a pharmacien, has been examining the different methods which have been proposed for detecting the presence of alcohol in chloroform.

He especially recommends two : the first, that namely of M. Souberain, is easy of application, but is not very delicate, as it will not detect a smaller quantity than 5 to 6 per cent. It consists in shaking the chloroform in a tube with sweet oil of almonds; the mixture remains transparent if the chloroform is free from alcohol—in the contrary case, it becomes more or less milky. The second process was proposed some time back by M. Roussin. It consists in the employment of the *binitrosulphide of iron*,* and is stated by the author to be extremely delicate. The experiment is made by introducing several grammes of chloroform into a tube or

* *Binitrosulphide of iron* is obtained by mixing a solution of nitrate of potash with sulphide of ammonium, then, while the mixture is being agitated, dropping in a solution of protosulphate of iron. The whole is boiled, evaporated to dryness, and treated with alcoholized ether, filtered, and the solution crystallized.

stoppered bottle, then adding a few centigrammes of the binitrosulphide, shaking the mixture, and allowing it to settle. If the chloroform is pure, it remains clear as water; but if it contains alcohol it assumes a brown tint, more or less deep, according to the proportion present. The presence of ether, aldehyd, methylic and amylic alcohols, are also detected by this reagent, which is excessively soluble in all these compounds.

A New Compound of Bismuth with Iodine and Oxygen.—M. Schneider, in an attempt to obtain iodide of bismuth in large crystals, by heating the compound for some time in a crucible, has produced a new compound, to which he assigns the formula ($Bi\ IO_2$). The mass which resulted from the heating of the iodide consisted of three layers, the first of which was crystallized iodide of bismuth, and immediately beneath it the new compound occurred in the form of fine copper-coloured crystalline plates.

This substance loses its iodine when heated strongly in contact with the air. Water, the alkalies and their carbonates, are without action upon it. Hydrochloric acid dissolves it in the cold, forming a yellow solution.

On the Iodo-Sulphides of Bismuth and Antimony.—In the preparation of iodide of bismuth by the process of M. Schneider, a crystalline residue remains in the retort, which contains bismuth, iodine, and sulphur. It is a mixture of a small quantity of iodide of bismuth with a large quantity of an iodo-sulphide, occurring in the form of small, brilliant, steel-grey needles, which are readily isolated by treatment with dilute sulphuric acid. M. Schneider has shown that this compound has the following formula: $Bi\ I, S_2$. It may be readily obtained by introducing into melted iodide of bismuth as much sulphide of bismuth as will dissolve. It closely resembles sulphide of bismuth, and has the same crystalline form. Its reactions are similar to those of the chloro-sulphide, which has also been described by the author.

Antimony yields under the same circumstances an iodo-sulphide—$Sb\ IS_2$, of a bright metallic lustre and a reddish-brown colour.

Action of Iodine on Bisulphide of Tin.—M. Schneider has shown that when a mixture of one equivalent of bisulphide of tin (mosaic gold) and two equivalents of iodine is heated gently in contact with the air, it liquefies, and yields a crystalline sublimate of the colour of oxide of mercury, which contains iodine, sulphur, and tin. Some deep-coloured crystals are produced at the same time, consisting probably of iodide of sulphur. The sublimate of iodo-sulphide of tin dissolves easily, and without decomposition, in sulphide of carbon and in chloroform, and crystallizes by evaporation in fine crystals of the colour of bichromate of potash. Water decomposes these crystals, with formation of hydriodic acid and deposition of sulphur and oxide of tin. The formula of the compound may be represented either as $Sn\ S_2\ I_2$, or $Sn\ S\ I, S\ I$.

A solution of iodine in bisulphide of carbon does not act, even in the cold, upon bisulphide of tin.

On the Density of Ice.—Considerable discrepancy exists between the numbers assigned by different experimenters as representing the sp. gr. of ice. This discordance is probably due to the difficulty which exists in the way of adapting the ordinary methods of experiment to this body without introducing sources of error.

M. L. Dufour has endeavoured to solve the problem, by finding a liquid in which the ice would float in equilibrium. By ascertaining the specific gravity of that liquid, the required result could of course be obtained. The fluid employed by M. L. Dufour consisted of a mixture of alcohol and water, cooled down to —8° or —10° Cent. At this low temperature the solution of the ice takes place with extreme slowness, a point which it is necessary to ensure. By employing the co-efficient of dilatation, the results are readily corrected to zero.

M. Dufour made twenty-four determinations, the results of which were comprised between 0.9162 and 0.9212, giving a mean of 0.9175. Great care was of course necessary in the selection of the ice, to avoid the presence of air bubbles or impurity of any kind. M. Dufour used artificially frozen distilled water, which had been previously well boiled.

On the Preparation of Antimoniate of Potash.—M. Reynoso has given the following process as a ready means of preparing antimoniate of potash. Recently precipitated hydrated oxide of antimony is dissolved in a solution of caustic potash, and permanganate of potash then added as long as the colour is destroyed. When a faint rose colour becomes permanently perceptible, the liquid is filtered, and may in that state be used as a test for soda.

Preparation of Carbonic Acid.—Messrs. Meschelynck and Lionnet have devised a means of preparing large quantities of carbonic acid from carbonate of lime, at a comparatively nominal cost. The operation consists in passing the vapour of water over carbonate of lime. It is well known that chalk undergoes decomposition at a moderately high temperature, and that the change is much promoted by the presence of steam; but the authors indicate that if the chalk be subjected at 100° to a current of steam, the whole of the carbonic acid is disengaged with sufficient rapidity to render the process a convenient one for use upon the large scale.

The authors recommend the following mode of operating:—Refractory earthen retorts, filled with chalk, are heated to dull redness in a reverberatory furnace. Currents of steam are then passed through the retorts, when large quantities of carbonic acid are immediately evolved.

ON THE PROXIMATE ANALYSIS OF PLANTS AND VEGETABLE SUBSTANCES.

BY FREDERICK ROCHLEDER, M.D.

(*Continued from page* 166.)

In consequence of the facility with which organic substances oxidize in contact with an alkali in the oxygen of the air, it is necessary to undertake the treatment with baryta *in an atmosphere of hydrogen.* To accomplish this, an aqueous solution of the substance under examination, as concentrated as possible, is introduced into a flask which is closed with a cork having three perforations. Through one perforation a glass tube passes which is bent below at an angle, and serves to connect the flask with a refrigeratory apparatus, and a receiver for the collection of the volatile decomposition products evolved. Through the second perforation, a glass tube bent at a right angle passes almost to the bottom of the flask, through which the hydrogen enters into the flask to drive out the air. The hydrogen is generated from granulated zinc and water by sulphuric acid, and first conducted through a washing bottle containing a solution of bichloride of mercury for the separation of the sulphuretted and arsenuretted hydrogen before it passes into the fluid. Through the third perforation the long beak of a funnel is stuck, which can be rendered air tight by a glass rod ground in above where the beak of the funnel begins. This funnel is filled, when all the air is displaced by hydrogen, with a concentrated hot solution of the hydrate of baryta in water. By raising the glass rod the baryta is allowed to flow into the flask, which is closed before the last drops have run in.* The baryta water may be so introduced into the flask that only a trace of air comes in contact with the contents of the flask. Often an insoluble compound of baryta with the organic substance results, so that a dense precipitate is formed. In this case the flask, which is heated on a sand-bath, must be frequently shaken, to prevent a deposition of the precipitate. Generally, the decomposition procceds more rapidly with baryta than with hydrochloric acid. Upon the termination of the decomposition the flask is allowed to cool, accompanied by the continued evolution of the

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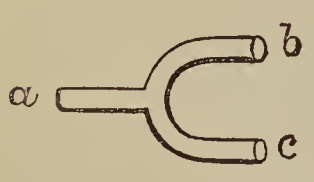
* When the hydrogen gas is evolved from the bottle in which the gas is generated, the necessary mixture of sulphuric acid and water for the continued development of the gas must be passed in through a funnel constructed in the same manner to prevent the ingress of the air into the bottle.

hydrogen gas. Either a clear solution results, consequently no insoluble baryta compound has been formed, or such is suspended in, or deposited at the bottom of, the fluid. Instead of hydrogen gas, either *carbonic acid gas* is conducted into the flask, or *dilute sulphuric acid* is poured in through the funnel which is capable of being closed. Both operations are intended to convert the excess of baryta into a carbonate or a sulphate. By the sulphuric acid always, and sometimes by the carbonic acid, the baryta compound of the decomposition product formed is decomposed. Whether carbonic acid or sulphuric acid should be used must be ascertained by an experiment which is made with a small portion of the contents of the flask. In this preliminary experiment carbonic acid is employed, and it is observed whether by filtering the fluid in contact with the air it undergoes a change. If no change happens, carbonic acid should be conducted through the fluid in a large quantity. On the contrary, if it changes in the air, the bulk of the fluid must be treated with sulphuric acid. Many substances are oxidized in contact with carbonate of baryta, but others are not. Many compounds which result by treatment of the substances with baryta water are almost quite insoluble in water when an excess of baryta is present, and as this separates by the carbonic acid they dissolve, or from the compounds formed with baryta, compounds poor in baryta are produced which are soluble in water, whilst those rich in baryta are insoluble. In such cases it is more advantageous to add alcohol to the contents of the flask, and to filter the whole. The carbohydrate, or its compound with baryta, is dissolved in the spirituous fluid, and the baryta salt of the second decomposition product remains on the filter. The mass changes on the filter when a readily oxidizable substance is contained in it. The carbohydrate is obtained alone in the solution, and may be obtained pure by distilling off the spirit and carefully precipitating the baryta by sulphuric acid and then evaporating the fluid free from baryta.

As it is desirable by treatment with baryta to test portions of the material, whether treated with carbonic acid or sulphuric acid, or mixed with alcohol, without bringing the whole mass of the fluid into contact with the air, I will here describe a method by which portions can be used for the preliminary investigation without bringing the entire quantity of the fluid from which these portions are taken into contact with the air. For this purpose, the end of the glass tube is closed through which the hydrogen gas and the aqueous vapour pass out, and the glass rod is loosened by which the filter serving for the conveyance of the baryta water into the flask is closed. By the pressure which the gas and vapour exercise on the surface of the fluid in the flask, the fluid rises up through the beak of the funnel, and fills the funnel more and more after the glass rod is withdrawn. When sufficient fluid has been forced in this way into the funnel, this is closed with the glass rod, and the glass tube opened. The portion of the fluid in the funnel required for examination may be removed by means of a pipette.

I must also mention a small arrangement which renders easy the displacement of the hydrogen gas by the carbonic acid gas, without permitting the entrance of air into the apparatus. This arrangement consists of a spur made of vulcanized caoutchouc. This forked tube is at *a* bound to the glass tube, bent at a right angle, which conducts the hydrogen gas into the flask. The forked tube is attached at *b* to the apparatus for evolving hydrogen at *c*, and is connected with a gasometer containing carbonic acid. While the tube at *b* is closed with a cock, carbonic acid is allowed to stream out of the gasometer until all the air is driven out of the conducting tube. The carbonic acid passes in at *a* freely, as the tube at *b* is closed by a cock. The tube at *c* is now shut with a cock, and the cock of the gasometer is also closed. Then *a* is attached to the tube in the flask, and *b* with the hydrogen gas apparatus, and the air expelled from the flask by the hydrogen gas. After the baryta has acted sufficiently long, and it is wished to conduct carbonic acid into the flask, the tube is closed at *b*, which in the mean while was open, and the tube is opened at *c*, and carbonic acid allowed to pass in from the gasometer.



When a clear fluid is obtained by the treatment with baryta, it is ascertained whether, by the addition of alcohol, a baryta compound is precipitated, while the

carbohydrate remains dissolved in the spirituous fluid. Often in this way a separation can be accomplished.

If a separation is not effected in this way, *carbonic acid* is conducted into the fluid until all excess of baryta is saturated with carbonic acid. In many cases the baryta compound of the decomposition product is thereby decomposed. The contents of the flask are heated now to the boiling point, while hydrogen gas instead of carbonic acid is passed through the fluid. By boiling the dissolved bi-carbonate of baryta is converted into the carbonate. The contents of the flask are then filtered. On the filter, carbonate of baryta and a decomposition product remain when the latter is insoluble in water, and was dissolved only as a baryta salt in the water. The carbohydrate is contained in the fluid frequently as a baryta compound (consequently not precipitated from the baryta by carbonic acid), either alone or together with the second decomposition product, which may be dissolved either free from baryta or as a baryta salt. When the substance, as ononine or populine, &c., is decomposed by baryta into a baryta salt and a copulated carbohydrate, a copulated carbohydrate and not a separated carbohydrate is obtained in the filtrate. On this account, we have always to ascertain whether a carbohydrate, or such a copulated compound, is obtained by the treatment with baryta in the heat. If, by heating with baryta, instead of a clear solution a solid compound is obtained, which is suspended in the fluid or is deposited therein, it is separated generally, as above described, as a precipitate by alcohol, and filtration of the fluid. When the contents of the flask have been treated with an excess of *sulphuric acid* instead of carbonic acid, and then filtered, sulphate of baryta is found on the filter, and sometimes a decomposition product, insoluble in water, mixed with the sulphate of baryta, and in the filtrate a little free sulphuric acid, and either both or one of the decomposition products dissolved therein. By the careful addition of baryta water the sulphuric acid is separated. The fluid freed from sulphuric acid is heated in a distillatory vessel, and the distillate examined for a volatile acid, perchance resulting from the decomposition of the original substance. The residue of the distillation is further examined by mixing a portion thereof with perchloride of tin, sugar of lead, vinegar of lead, and baryta water. It generally happens that one of the decomposition products is thrown down in the form of an insoluble compound by one of these precipitants, while the other decomposition product remains in solution. The excess of tin or lead salt is removed by sulphuretted hydrogen, and the excess of baryta by sulphuric acid. With perchloride of tin, after the removal of the sulphuret of tin and expulsion of the sulphuretted hydrogen, the hydrochloric acid is to be separated by suitable means.

In individual cases, by *the application of caustic soda or potash* in the place of the hydrate of baryta perfect solutions are obtained, from which the potash or soda compound of the decomposition products is separated in an insoluble form after the substance under examination has split up. In such cases it is naturally advantageous to employ soda or potash instead of baryta. Generally, the potash or soda compounds separated are insoluble only in potash or soda solutions, but not in pure water. Consequently the washing must be performed with these solutions. The filtered solution is carefully saturated with sulphuric acid, evaporated, and the second decomposition product removed by alcohol from the alkaline sulphates, which are insoluble in that menstruum.

From the results which are obtained by the described investigation it may be determined whether by the treatment with acids or baryta the substance remains unchanged or not, or whether it is split up into two or more products. *But the case is possible that after the treatment with acids or alkalies no two decomposition products can be discovered, although the original substance no longer exists.* In this case, where only one substance results in the place of another by the action of acids or alkalies, the original substance is converted into a new body manifestly under the reception of the elements of water, or the expulsion of oxygen and hydrogen in equal equivalents that is under the separation of water. The substance under examination, therefore, does not belong to the class of copulated compounds.

When the methods of examination here described have shown that the separated crystals contain no member of the family of organic gases, and no copulated compound which is decomposable by acids into a carbohydrate and a second decomposi-

tion product, or by alkalies can be broken up into an acid and a copulated carbohydrate, we have to do with *an indifferent vegetable substance*, upon whose nature only an extended investigation can afford a conclusion.

There are substances in the vegetable kingdom which must be reckoned among *the copulated compounds but which do not afford a carbohydrate by splitting up by either acids or alkalies*, for example, athamantine. But as this body breaks up into two products by the action of acids and alkalies, we are already acquainted with its behaviour and nature by the attempts made to decompose it into a carbohydrate and a second body.

When we are thus far acquainted with the crystals, we proceed to the examination of the *mother liquor* from which they have separated, which must always contain still a little of the substance which has crystallized out, as it is impossible for the separation to be a total when it has been accomplished merely by crystallization. But if originally no crystals have separated, *the entire amorphous residue* must be examined *which was obtained after the treatment of the watery decoction with sugar of lead and vinegar of lead, and sulphuretted hydrogen, and evaporation.*

It has been previously mentioned that we must endeavour to separate this residue, when it has been suitably concentrated and treated with alcohol, into a soluble and an insoluble portion, and also to treat the alcoholic solution with ether, to ascertain whether one or more constituents are thereby precipitated.

By the treatment of the aqueous decoction with animal charcoal (page 132) it has been ascertained whether bodies are contained therein which are fixed by animal charcoal or not. When such bodies have been detected in the decoction which the animal charcoal retains, we must simplify the method of examining the residue in question of the watery decoction precipitated with sugar of lead and vinegar of lead by the application of animal charcoal. If this residue has been treated with alcohol, and thereby a separation has been effected into a part soluble and a part insoluble in alcohol after the evaporation of the alcohol from the part therein insoluble, and the distillation of the alcohol from the part therein soluble, both the resulting residues are separately dissolved in water and treated with animal charcoal. When a precipitate has formed by the addition of ether to the alcoholic solution of a part of the residue, this precipitate, after it has been collected on a filter, as well as the residue of the filtered liquid freed from alcohol and ether, are dissolved in water, and the solutions treated with animal charcoal. The animal charcoal, as before described (page 132), is quite exhausted with alcohol to obtain a solution of the body which it has retained, which, after distilling off the alcohol, is examined for the presence of organic bases and copulated compounds in the same manner as described for the crystals, which sometimes are deposited from the watery decoction after treatment with sugar of lead, vinegar of lead, and sulphuretted hydrogen, and evaporation. As neither all colouring matters nor all bitter principles and organic bases are retained by animal charcoal when their watery solutions are placed in contact with it, a separation of two colouring matters, two bases, or two bitter principles, can often be effected by charcoal, which can only with difficulty be accomplished in other ways.

The further examination on the presence of organic bases and bodies capable of splitting up as copulated carbohydrates or other indifferent organic bodies, is now performed in the same manner with the portions extracted from animal charcoal, the soluble in alcohol and ether, and the soluble in alcohol but insoluble in ether portions of the residue of the watery decoction, as in the examination of the crystals above described which have separated from the watery decoction after treatment with neutral and basic acetate of lead and sulphuretted hydrogen, and evaporation of the fluid.

In most parts of plants *sugar* is contained which passes into the decoction by boiling with water. It is neither precipitated by sugar of lead nor vinegar of lead, and therefore remains dissolved in the fluid which has been filtered from the precipitate, and freed from lead by sulphuretted hydrogen, and concentrated by evaporation. As this residue always contains acetic acid in rather considerable quantity, derived from the employment of the acetates, the sugar never crystallizes out. At least I have never obtained sugar in this way. By treating this residue with alcohol, the sugar dissolves therein, and the acetic acid likewise goes over to the alcohol.

On the addition of much ether, the sugar separates from the acetous alcoholic solution as a heavy layer like turpentine at the bottom of the vessel, and adheres to its sides as a gummy covering. With the sugar, under some conditions, other bodies may be precipitated. On that account, the impure sugar is dissolved in alcohol, and mixed with a strong solution of potash. The sugar compound of the potash separates, and most of the other substances remain dissolved in the alcohol containing potash. Whether cane sugar or grape sugar is contained in the watery decoction, is not ascertained by this method of proceeding. This may be less easily discovered by the treatment of the watery decoction than by the examination of the spirituous extract of the material under examination. Of this matter we shall speak further on.

It is merely to be observed here that the organic bases, or their acetates, are extracted almost always as the copulated carbohydrates by alcohol from the residue which is obtained from the watery decoction by treatment with sugar of lead, vinegar of lead, and sulphuretted hydrogen, so that only in exceptional cases bodies of that kind are found in the portion not dissolved by alcohol. On the contrary, such substances are frequently thrown down by ether from the alcoholic solution, and then in the majority of cases are precipitated with the sugar.

Very frequently a body is contained in the alcoholic extract of the residue in question of the watery decoction which is not precipitated by ether because it is soluble in a mixture of ether and alcohol. Its presence may be easily recognized when the residue which remains after the expulsion of the ether and the alcohol is treated with moderately diluted hydrochloric acid. The fluid becomes turbid when a little of this body is present, and a separation of oily globules on the surface of the acid fluid ensues, and a separation of resinous flocks when it exists in larger quantity, takes place, diffusing a peculiar odour of an ethereal oil. I have met with this substance in plants of the most varied families, so that it may be recognized as one of the most widely-spread constituents of the vegetable kingdom, although it does not exist in all plants. This substance was found by Kawalier in the pinus sylvestris, and analyzed by him, and termed *pinipicrine*. It is a copulated carbohydrate, which is broken up by hydrochloric acid into sugar and an ethereal oil, of which the great part becomes a resin when separated.

As the precipitates which sugar of lead and vinegar of lead produce in the watery decoction of the material under examination are not absolutely insoluble in water, it is intelligible that always after the separation of the lead by sulphuretted hydrogen a fluid is obtained, and by the concentration of the fluid a residue results which contains small quantities of those substances the bulk of which were precipitated by the salts of lead above named, so indeed that by the addition of a little vinegar of lead always a little precipitate forms in this residue, if not very much. When these small quantities of dissolved substances are impeding the separation of other bodies, they must be removed by vinegar of lead, and the lead then separated by sulphuretted hydrogen.

We often find it stated in accounts of analysis that the sugar of the watery decoction, which frequently acts very injuriously in the investigation of the other constituents, must be destroyed by fermentation with the aid of yeast.

But a removal of the sugar in this way can only give occasion too easily to delusions. When no constituents are present which undergo in contact with yeast a splitting up, the constituents still are decomposed by the yeast and the fermenting sugar. It has been long known that urea, which is not decomposed by yeast, breaks up into carbonic acid and ammonia when it is in a solution of sugar which is set with yeast into fermentation. Other substances also may be decomposed in a similar way when they are contained in a fermenting solution of sugar. On that account this destruction of the sugar by fermentation must only be undertaken as an aid for the isolation of one or more constituents when it has been already discovered that none of the constituents undergo by this method a splitting up or an alteration.

The precipitate which was obtained by sugar of lead in the watery decoction contains almost never an organic base; on the contrary, one or the other constituent which forms with oxide of lead an insoluble compound may be a copulated compound. In the examination of the fractional parts which were prepared from this

precipitate according to the method described at page 133, attention should be directed to this point, and the method should be employed with hydrochloric acid and baryta (or soda, or potash) as described at pages 163, 166.

In the same manner as directed for the residue which is obtained from the watery decoction treated with sugar of lead, vinegar of lead, and sulphuretted hydrogen, is *the residue dealt with which remains when the watery decoction was filtered through animal charcoal previous to its treatment with the lead salts, and also the residue which remains behind after the precipitation to the watery decoction with alum and ammonia, evaporating and extracting with alcohol, and distilling off the alcohol.* Thus we have in these three examinations a mutual control of the correctness of the results obtained by each individual examination, and consequently a constituent can scarcely be overlooked, and also conclusions may be drawn on the nature of the individual constituents.

(To be continued.)

CULTIVATION OF THE CINCHONA TREES IN JAVA.

At a recent meeting of the Society of Pharmacy of Paris, M. Schaeffèle communicated the following information on this important subject, derived from a private letter of M. de Vry, Chemical Inspector at Bandong, Java:—

"The cultivation of the Cinchona tree in the island of Java is in full prosperity. The young trees already exceed the height of five metres (nearly sixteen and a half feet); they have produced thousands of fruit, the seeds of which have for the most part germinated, and thrown out a considerable number of shoots.

"Dr. de Vry is about to publish a first memoir on this subject, of which the text, in German, will shortly appear in the *Bonplandia.* This work comprises the cultivation and chemical composition of the Cinchona. He has already forwarded to his Government some sulphate of quinine, quinoidine, and pure cinchonine. He has now obtained four per cent. of alkaloids, which promises well for the future.

"This chemist is about to undertake a work which will have for its object the determining the relative richness of the barks, according to the different altitudes under which the Cinchona trees grow and develop.

"When we recollect the isolation of the Cinchona trees in the forests of South America, and the difficulties to be overcome in the discovery of others, often at great distances; when we know with how little consideration the natives fell the Cinchona trees, and when we contemplate the scarcity that must arise at some time or other; we cannot too much applaud the persevering efforts and great sacrifices of the Dutch Government. In short, everything promises, that in the course of time the cultivation of the Cinchona in the mountains of Bandong will supply our generation with regular and inexhaustible supplies."

In consequence of this note of M. de Vry, M. Réveil observed, that at the last meeting of the Imperial Society of Acclimatization, a prize of 1500 francs had been proposed for a successful attempt to acclimatize the Cinchonas in France or in the mountains of Southern Europe. This prize will be awarded in 1861.—*Journal de Pharmacie et de Chimie.*

ON THE IMPURITIES OF COMMERCIAL ZINC,

With special reference to the residue insoluble in diluted acids, to sulphur, and to arsenic.

BY CHARLES W. ELIOT AND FRANK H. STORER.

The above is the title of a valuable paper read before the American Academy of Arts and Sciences, May 29th, 1860, and published in vol. viii., new series, of its memoirs, of which it occupies forty pages quarto. The importance of pure zinc in chemical, and especially in medico-legal researches, has been a prompting motive with the authors in their work.

In order to make the results as general as possible, the authors obtained authentic specimens of zinc from the following sources, viz.:—

1. Silesian zinc.
2. Vieille Montagne (Belgium) zinc.

3. New Jersey (American) zinc.
4. Pennsylvania zinc (Pennsylvania and Lehigh zinc works, Bethlehem, Pa.).
5. Vieille Montagne zinc, such as is used in the U. S. Mint.
6. A zinc labelled "Zinc pur," Rousseau Frères, Paris.
7. A sheet zinc of unknown origin, obtained at Berlin (Prussia).
8. An English zinc, made near Wrexham, North Wales.
9. An English zinc, from the Mines Royal, Neath, Glamorganshire.
10. An English zinc, from the works of Dillwyn & Co., Swansea.
11. An English zinc, from the works of Messrs. Vivian, Swansea.

A qualitative examination of the residue left by these zincs, when treated with dilute acids, showed that they consisted chiefly of *metallic lead.* In fact, the authors have arrived at the conclusion, that lead is the chief impurity in commercial zinc, and that carbon, tin, copper, iron, arsenic, and other impurities found in it by previous observers, occur either in very minute quantities, or rarely and doubtless accidentally.

Lead.—The authors found the following per-centages of metallic lead, estimated as sulphate, using diluted SO_3, saturated with sulphate of lead, as the solvent of the zinc, and treating the insoluble residue with diluted NO_5 and washing it well:—

Names of Zinc.	Weight of Zinc taken.	Weight of Lead obtained.	Per-centage of Lead.
1. Silesian	23.8066 grammes	0.3472	1.460
2. Vieille Montagne	25.2795 "	0.0738	0.292
3. New Jersey	28.672 "	0.0225	0.079
4. Pennsylvania*	26.522 "	0.0000	0.000
5. U. S. Mint	24.5308 "	0.1212	0.449
6. Rousseau Frères	24.3432 "	0.0259	0.106
7. Berlin	23.074 "	0.2990	1.297
8. Wrexham	29.999 "	0.3569	1.192
9. Mines Royal	38.8276 "	0.3197	0.823
10. Dillwyn & Co.	31.6425 "	0.5256	1.661
11. Messrs. Vivian	27.724 "	0.4203	1.516

The authors carefully verified their processes for estimating the lead by determining the SO_3 in each specimen of sulphate; and also answered the question, whether the use of diluted SO_3 saturated with sulphate of lead would introduce lead into the result, satisfactorily in the negative.

Cadmium and Tin.—The filtrates from the precipitates of sulphate of lead of the several zincs enumerated above, except that from Pennsylvania, were saturated with sulphuretted hydrogen for twenty-four hours or upwards, and the small precipitates which separated were filtered off, washed quickly with sulphuretted hydrogen water, dried, and ignited; they were then treated with a few drops of nitric acid, again evaporated to dryness, ignited, and weighed. The colour of these precipitates was yellowish-brown, except that from New Jersey zinc, which was blackish, owing to the copper it contained, as afterwards ascertained. The authors determined the absence of arsenic and antimony, and the precipitates were therefore the oxides of tin or cadmium, or both. The amounts of these precipitates from the same weights of zinc, as in the table above, and in the same order, omitting the Pennsylvania zinc, are as follows, the numbers giving the amount of the precipitates per cent. of the zinc treated:—

No. 1.	0.0564	No. 7.	0.0178
No. 2.	0.0281	No. 8.	0.0070
No. 3.	0.4471	No. 9.	0.0041
No. 5.	0.0098	No. 10.	0.0035
No. 6.	0.0406	No. 11.	0.0285

Of these samples, Nos. 1, 5, 6, 8, 9, and 10, contained none or but faint traces of tin, whilst the others gave distinct spangles of tin by the blowpipe test.

Copper.—None of the specimens but that from New Jersey gave the slightest evidence of the presence of copper, and that was found to contain 0.1298 per cent. of that metal.

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* This zinc gave no residue.

Iron.—The authors examined three of the samples for this metal, but did not feel it needful to push them further, as published experiments already show that its proportion rarely exceeds two-tenths of one per cent. They found 0.2088 per cent. in the New Jersey zinc; 0.0586 in the Mint zinc; and 0.674 in the Berlin (sheet) zinc.

Carbon.—The authors, after some carefully conducted experiments, have arrived at the conclusion that carbon is much more rarely a constituent of commercial zinc than has been frequently believed, as their very accurate experiments gave hardly a trace of evidence in favour of its presence.

Sulphur.—The authors found sulphur present in each of the specimens enumerated by adding ten or fifteen grammes of each zinc to a mixture of chloride of calcium and pure muriatic contained in a small flask, the neck of which contained paper moistened with alkaline acetate of lead. Every precaution was taken to avoid sulphur in the agents used, as described at length in the authors' memoir.

Arsenic.—The authors have very thoroughly investigated the subject of arsenic as an ingredient of commercial zinc, and, to assure themselves of the accuracy of their experiments, have investigated the American acids with a view to the same impurity. The authors believe that the general opinion that arsenic is a very common impurity in commercial zinc may be traced to Proust, who, with others, long before the discovery of cadmium in 1817, most probably confounded the sulphides of these metals, the latter of which being a common admixture. The delicate indications of Marsh's apparatus, which so easily detects arsenic in zinc, when present, added to this belief before attention was turned to the contamination of acids by the same metal; and there is reason to believe, at times, that this has been the source of the metal when it has been attributed to the zinc.

"The conclusions at which we have arrived, after a long course of experiments with many different zincs, and various acids, are these—first, that much of the zinc of commerce is free from arsenic, or at least contains no arsenic that can be detected by the most delicate tests for that metal; secondly, that the sulphuric and chlorohydric acids found in commerce do very often contain arsenic, and are always so liable to contain it as to be utterly unfit for use in Marsh's process without special purification for that purpose. The steps by which we are led to these results, and the evidence on which they are founded, we proceed to describe. We have used exclusively Marsh's process for the detection of arsenic, applied with the apparatus and with all the precautions recommended by Otto.* Our apparatus consisted of a flask provided with a funnel tube, and a tube bent at right angles, with which were connected by connectors of sheet india-rubber, first, a tube of the form of a chloride of calcium tube, filled with asbestos; secondly, a similar tube filled with pumice-stone soaked in caustic potassa; and thirdly, one filled with chloride of calcium. Through these three tubes, in the order in which they are named, the gas generated in the flask was obliged to pass before it arrived at the reduction tube, which was of hard German glass, and about one centimetre in diameter. The reduction tube was drawn down to a fine bore, and during the progress of an experiment, was heated by one of Bunsen's triple gas-burners. To prevent any elevation of the temperature in the flask during an experiment, it was immersed in cold water, and the dilute acid used was always cold, and added in small quantities. With this apparatus (which for convenience we shall designate as Otto's apparatus), taking every possible precaution to ensure its perfect cleanness, we made several experiments upon Silesian zinc. Two hundred grammes of this spelter, carefully granulated, were used in each experiment, and the sulphuric acid employed was a commercial acid made in this country from Sicily sulphur. We were not unaware of the fact that arsenic is almost invariably found in the foreign sulphuric acid made from various impure sulphurs of unknown origin, or from pyrites; but it is a common impression that the American acid manufactured directly from Sicily sulphur is free from arsenic. Positive statements to this effect have been made by chemists who have had mainly in view the common use of sulphuric acid in the preparation of chemical compounds used in Pharmacy, and the assertion has enough plausibility to command ready and general belief. Using such acid and two hundred

* *Manual of the Detection of Poisons.* New York: Baillière. 1857.

grammes of Silesian zinc, we obtained at the end of an hour, during which the reduction tube was heated, a deposit of arsenic perfectly distinct, though not bright enough to be called a mirror. Our next experiment was made with the same acid upon two hundred grammes of a sample of Vieille Montagne zinc, perfectly clean and carefully granulated. At the end of the hour during which the gas was passed through the reduction tube, a brownish, volatile coating was found in that part of the tube where the bore was smallest. These experiments on Silesian and Vieille Montagne zinc were several times repeated, and always with the same result ; the deposit in the reduction tube was often too thin and slight to be positively identified as arsenic ; but it could not be distinguished from the deposit of that metal, and would have been perfectly fatal in a medico-legal investigation, or in any case in which absolute purity of the materials was desired. Not convinced that the zincs were the source of the arsenic, we desired to prepare a quantity of sulphuric acid in which the presence of arsenic could not possibly be suspected. To attain this object, we subjected a specimen of American sulphuric acid to the following process :— The acid was first boiled with a little flowers of sulphur, as proposed by Barreul, in order to free it from the nitrous fumes which the common sulphuric acid almost always contains ; a small quantity of pure chlorohydric acid was then stirred into the cooled acid, which had been carefully decanted from the free sulphur, and the whole again boiled ; to the acid again cooled, a second addition of chlorohydric acid was made, and again the acid was heated till dense white fumes had been escaping for upwards of half an hour. During this process the volatile chloride of arsenic is completely driven off, the second addition of chlorohydric acid being made, as has been recommended by H. Rose, in order to ensure this result. Lastly, a portion of chlorine-water was added to the cooled acid to oxidize any sulphurous acid which might be contained in it ; and after a third boiling, the acid, cooled and diluted with three parts of water, was ready for use. This method of purifying sulphuric acid is a combination and modification of several well-known processes. With the acid thus prepared, we tested two hundred grammes of Vieille Montagne zinc, and after passing, during more than an hour, a continuous gentle stream of gas through a reduction tube, of which about four centimetres were maintained at a bright red heat, we found that there was absolutely no deposit whatever in the cool and narrow part of the reduction tube. With the same acid and apparatus, two hundred grammes of Pennsylvania zinc (which has proved to be altogether the purest zinc in our possession) gave absolutely no deposit of any kind in the fine reduction tube at the end of one hour, the time during which, in all our examinations for arsenic, we maintained a steady flow of hydrogen through the red-hot reduction tube. In order to satisfactorily establish these conclusions it was necessary to prove, by frequent repetition, that the same result might always be expected from these two zincs, and that their freedom from arsenic was a property shared by the whole sample, and not an accidental peculiarity of a particular fragment. At sundry times we therefore repeated again and again the long and careful test for arsenic above described with these two samples of spelter, and invariably arrived at the same conclusion: namely, that no deposit of any kind could be obtained in the reduction tube from these zincs and purified sulphuric acid."

The authors, by adding infinitesimal quantities of arsenious acid to these zinc and acid mixtures, say that they could easily detect a proportion of arsenic less than the ten millionth part of the zinc used.

The authors subsequently applied the test to the other zincs of the list, and all of them, including the New Jersey zinc, were found to contain various minute quantities of arsenic. The authors finally remarked that the purest of all the zincs they have analyzed, is that manufactured at the Pennsylvania and Lehigh zinc works, Bethlehem, Pa. This spelter dissolves in dilute sulphuric acid without leaving any appreciable residue, and therefore contains no lead ; indeed, a trace of cadmium is the only impurity, whose presence in the zinc we could confidently assert. The ore from which this spelter is made is the hydrated silicate of zinc (electric calamine), and it is not surprising that this mineral should yield zinc of singular purity, if the ore be carefully selected. We have stated above, that our first sample of this zinc was free from arsenic, but a second sample was not pure in this respect. At these works the oxide of zinc is manufactured as well as the

metal, and we learn from a letter addressed to Prof. Brush, by Mr. Wharton, the director of the works, that the crust from the oxide furnaces has now and then bee worked into spelter, and that the ore used in making the oxide is less carefully selected than that which goes to the spelter furnaces, and is much more likely than the latter to contain both blende and pyrites. This fact may account for the occurrence of arsenic in some specimens of this spelter, while the greater part of it, manufactured from carefully selected silicate of zinc, is perfectly free from that impurity. There seems to be no reason why zinc of uniform purity should not be obtained from this excellent ore.—*American Journal of Pharmacy*, September, 1860.

ON PENGHAWAR DJAMBI.

BY DR. VINKE.

After reporting fourteen cases in which the hemorrhage from serious wounds or bleeding ulcers was promptly and permanently arrested by the application of penghawar, the author communicates the experiments made by him with a view to ascertain the *modus operandi* of this remedy. The treatise contains the following information:—

1. *On the phytography of penghawar (paleæ cibotii).*—The specimen examined by the author had been to the greater part separated from the stipes of the fern, and consists of delicate filaments, half an inch to two inches long, which are very soft, flexible, and so light that they keep themselves floating in the air for a long time. The shortest ones are thicker, dark grey or blackish, and are present in penghawar, but in small quantity. The longer filaments are silky, shining, tortuous, very delicate, and of golden, light-brown colour. It weighs so little that six grains constitute a considerable mass—sufficient to arrest bleeding from an artery one line in diameter. It swims on water, but falls to the bottom of the vessel after about half a minute, as it absorbs water; it gives an empyreumatic odour on being heated, burns faintly on being brought in contact with the flame of a candle, and detonates under complete combustion, diffusing an odour like agaric. On microscopic examination, the author found that the filaments of penghawar have nothing in common with hair. They form band-like, flat processes with articulations; their breadth surpasses their thickness three times and more. The joints are dark brown, resemble those of the shave-grass, but have delicate, often ramified processes. The part between the articulations is two to four times longer than wide, either of uniform width, or, in the dried state, conical, smaller at one end, of yellow colour, translucent, covered with violet granules, which, together with the processes of the joints, fall off on applying a weak solution of caustic potassa, but become more distinct on being soaked in ether. The base of the filaments is either smaller, with branchy processes, or thicker, surrounded by hairs; their upper end is drawn out into a transparent, needle-shaped tubule. Each filament forms a hollow sheath which is partitioned by transparent diaphragms at the articulations. The cavity of the filament easily fills itself with any kind of fluid; fine powders do not penetrate into uninjured joints. In a solution of sulphate of iron the filaments become blackish, nearly opaque, and very brittle; if they have been previously soaked in ether, they assume a dark-brown colour in the above solution. By iodine and dilute muriatic acid the physical properties of penghawar are not changed. A solution of caustic potassa becomes dark, the filaments themselves assume a bright-yellow colour in it, are rendered very smooth and soft, in consequence of losing their granular cover and their processes. The author does not attach much importance to the chemical reaction of penghawar, and only states that it forms not a green (v. Bemmelen) but a dark violet, blackish precipitate with the salts of iron.

2. *Results of experiments on freshly abstracted blood, and on living individuals.*—All the experiments show that the hæmostatic effect of penghawar depends upon the capillary attraction of the water, which "exceeds the force by which the water in living blood is held in combination." The coagulation of the blood (also of that which is freshly drawn) is the immediate consequence of the blood being deprived of its watery portion—a fact which is confirmed by comparative experiments with capillary glass tubes. Penghawar, however, acts with a five-times greater rapidity. A circumstance which promotes the firm adhesion of the coagulum to the surface of

the wound and the permanent occlusion of the orifices of the vessels, consists in the elasticity and delicacy of the filaments; on moderate pressure the latter penetrate into the finest interstices and apertures on the surface of the wound, and thus cause coagulation of the blood not only on the surface of the wound, but also in the interstices of the tissues next to it. But it is particularly by the following qualities that penghawar excels other hemostatics:—

(1.) It arrests, quicker than any other pharmaceutical means (agaric, sponge, bovista, &c.), parenchymatous, venous, or arterial hemorrhage, provided the diameter of the artery does not exceed one line and a half. [The Indians stop bleeding, also, from greater arteries with penghawar.] (2.) It produces a coagulum even in cases where the blood has changed so much that it has nearly lost the property of coagulating, or where the walls of the vessels are so diseased that they are incapable of a plastic process, as, for instance, in carcinomatous and scorbutic ulcers. (3.) Penghawar does not change the vitality of the wound or ulcer, and therefore does not exert an injurious influence upon the healing process.

Penghawar acts better when crumbled than if applied entire. It is to be kept in a dry place. Five grains are sufficient to arrest considerable hemorrhage; more than one scruple was never required. It is pressed for two or three minutes directly on the bleeding surface, after which, if possible, a compressive bandage or strips of adhesive plaster are applied over it, taking care not to draw the wound too much together. If the bleeding does not proceed from the whole surface of the wound, it is not necessary to fill out the entire cavity of the wound or ulcer with penghawar. The hemorrhage ceased more rapidly, if the author pressed the penghawar (in the form of a pencil) so upon the bleeding surface that the filaments were directed perpendicularly against it. The internal administration of penghawar, as recommended by Gaupp and others, is quite useless.—*Med. Zeitung Russlands*, 42-43, 1859, and *Schmidt's Jahrbücher*, April, 1860.

ON INDIAN HEMP.

BY DR. FRONMULLER, OF FUERTH.

Indian hemp has become known but lately. First welcomed as a new narcotic remedy, it seems to have been abandoned again on account of uncertain and weak effect. This is at least the case in Germany and France, and the causes of it are easily found. The contradictions of the authors are discouraging. Rigler, for instance, observed an accelerated circulation after the use of haschisch; Sigismund, a diminished frequency of the pulse; Ley found an exciting effect on the sexual organs; Scanzoni denies it; some saw contraction of the pupil, others not, &c.

It is further a fact, that the effect of hemp in the East is quite different from the effect it produces in Europe; what can be effected in Calcutta or Algeria with one or two grains, requires in Europe thirty or forty times as much. Two grains are considered at Cairo a large dose; with us, eight grains are the smallest dose. There is probably some ethereal ingredient in the Oriental hemp which is destroyed by transport. Many practitioners hesitated to increase the doses sufficiently for the desired operation. Having once employed the remedy, I made up my mind to ascertain the truth, and continued my experiments until they embraced one thousand cases. But before giving the result, I will shortly refer to the plant and its therapeutical exhibition.

The external appearance of Indian and European hemp is the same, as are their botanical characters. The differences described by many authors are probably due to local causes only; the only real difference is the quantity of narcotic resin which is secreted by particular glands—like the lupulin, in the hop plant. This resin exudes, in India, from the flowers, leaves, and stalks, and is known there by the name of *churrus*. Its quantity increases with the southern direction.

The hemp cultivated in Edinburgh by A. Christison exhibited no churrus; plants collected in Regent's Park, by Ley, contained about one-tenth as much resin as their Oriental sisters. French and German hemp appears to be richer in resin; the hemp growing in Italy still more so. Greece and Asia Minor furnish quite a powerful product; but by far the strongest is from Persia and India, although even there variations are found according to the soil. The quality of the resin seems to

be subject to a similar variation, showing the same difference as rhubarb, roses, and poppies do in different climates. All of them require the rays of an Asiatic sun for the full development of their powers.

Asia is evidently the native country of hemp. This is proven by direct statements, by its being frequently mentioned in the history of Oriental nations, and by the very derivation of the name: Cannabis, Kannabis, from the Kanub—Ganja of the Arabs. (Ainslie, *Mat. Ind.*, vol ii., p. 190.) From China, India, and Persia, the cultivation of hemp spread to Egypt, over Africa to Europe and America, the fibres and the oil recommending the plant.

Already Homer speaks (*Odyssey*, N., 220-230) of the exhilarating effects; for this is undoubtedly meant by the *Nepenthes* which caused all suffering to be forgotten. Helena received it from Egypt, and there hemp was long esteemed on account of its intoxicating quality. (Prosp. Alpin., *de Medic. Ægypt.*) Even to this day hemp-wine is used by the Orientals for the purpose of intoxication. Herodotus mentions cloths made from hemp, and refers also to fumigations used in Scythia. Galenus was well acquainted with the narcotic effects of haschisch; and in a Chinese work, now in the great library of Paris, it is stated that a Chinese physician, Hoa-Tho, living A.D. 220-230, administered to patients he wanted to operate on a medicine prepared from hemp, and made them in that way insensible. Rigler says a preparation of hemp has been used for the same purpose in India since times immemorial; it is there called *Esrar—i.e.* secret. During the Crusades, a Persian, Hassan Ben Ali, famous for the number and fanaticism of his soldiers, used haschisch to intoxicate and excite them, so that all over Asia Mohammedans as well as Christians trembled before them. These fellows—exterminated in 1256 by the Mongolian chief, Hulakan Khan—received, from their using haschisch, the name of Haschischin, Haschaschin. By perversion, that word changed into assassin.

For the sake of the narcotism alone, hemp is extensively used at present in a great part of Asia, Africa, and South America, either smoked (in Algeria, Morocco, by the Hottentots and Brazilians), or in the form of electuary, confection, tincture, pastiles, &c. In spite of the Crusades, this narcotic quality of hemp was not known in France until after the campaign in Egypt. England received the first notice of it through her physicians practising in the East Indies. In Germany, Dr. Molwitz pointed out hemp, in 1818, as a substitute for opium; Hahnemann employed it against affections of the nervous system. Since 1830 a large amount of information, regarding especially the power and qualities of the Indian hemp, has been published, mostly by English and French physicians.

The few chemical analyses made of the hemp plant, show in it a gum, a bitter extractive matter, albumen, chlorophyll, ethereal oil (about twelve drops in twenty-eight ounces), and a resin, called by some *cannabin*, which appears to be the effective ingredient. No alkaloids have been found so far.

The more important preparations which have been employed are: for internal use, the powdered herb, in pills or powder; Oriental haschisch—a mixture of the foregoing with ginger and cinnamon, in different proportions, therefore not very reliable, may be imitated by mixing the powder of the leaves with sugar and mucilage of gum tragacanth, so as to form cakes—the resinous extract, best in pills; a tincture made by dissolving the extract in ten to twenty parts of alcohol, and an emulsion of the resin. Churrus, the pure exudation of the plant, is used like the extract, but rarely met with in commerce. Externally the resin is applied endermatically, or in the form of embrocation, with oils, ointments, chloroform, &c.; also in injections.

Physiological experiments on healthy persons, instituted by Landerer, Beron, Rech, Wolff, Judee, Schroff, myself, and others, show more or less a disturbance in the digestive tract; affection of the nervous system, with convulsive movements and sudden shocks; congestion to the brain; confused ideas; excited imagination, with frequently changing pictures; torpor, and sleep—the cerebral symptoms being more constant, while the others vary to a great extent, sometimes nothing being mentioned but a few confused ideas, followed by sleep. Fumigations with haschisch produced in two consumptive patients, first, some excitement, then a short sleep, without any important narcotic symptoms afterwards.

The effects of hemp are combated by the same means as those of opium; vegetable acids, coffee, emetics, cold applications, leeches to the temples. Landerer recommends

sea-water, Cayenne pepper, salted victuals, caviar, strong coffee, and, as an emetic, the sulphate of copper. At Vienna, lemonade and coffee proved of good service. O'Shaughnessy gave acids in large doses.

The long-continued use of Indian hemp induces prostration, dropsy, and sometimes a liability to sudden fits of mania, with great inclination to destroy and ruin. This, however, I think more ascribable to the alcohol mixed and taken with the haschisch, than to the latter. The cataleptic fits of the Indian jugglers are also explained through the agency of hemp, though it occasions such fits extremely seldom.

During the short time since its use as a medicine has become known in Europe, hemp has been extensively employed, and mostly as a calming, antispasmodic remedy.

[Various diseases are enumerated in which the remedy has been exhibited, and the author concludes with the following results of his experience:—]

As an external remedy, I have used hemp many hundred times to relieve local pains of an inflammatory as well as neuralgic character.

Judging from my experiments, I have to assign to the Indian hemp a place among the so-called hypnotic medicines, next to opium; its effects are less intense, and the excretions are not so much suppressed by it. Digestion is not disturbed, the appetite rather increased, sickness of the stomach seldom induced, congestions never. Hemp may consequently be employed in inflammatory conditions. It disturbs the expectoration far less than opium. The nervous system is also not so much affected. The whole effect of hemp being less violent, and producing a more natural sleep, without interfering with the actions of the internal organs, it is certainly often preferable to opium, although it is not equal to that drug in strength and reliability. An alternating course of opium and Indian hemp seems particularly adapted to those cases where opium alone fails in producing the desired effect.—*Prager Vierteljahrschrift*, xvii., 1860; and *North-American Medico-Chirurgical Review.*

TANNIN AS ANTIDOTE TO STRYCHNINE.

BY PROF. KURZAK, OF VIENNA.

From want of a reliable antidote, the treatment in cases of poisoning by strychnine hitherto consisted principally in endeavouring to evacuate the poison, to combat the frightful spasmodic symptoms by narcotics, and to re-establish respiration, when it finally ceased, by artificial means. Donné proposed iodine, chlorine, and bromine as antidotes to strychnine; Garrod, Rand, Morson, and Falek recommended prepared animal charcoal; but the efficacy of these substances has been neither tested sufficiently by experiment nor proved by experience. The same is true in regard to tannin, and the astringent vegetables containing it, their infusions, decoctions, &c. Although they recommended themselves by the fact that tannin forms chemical compounds, insoluble in water, with strychnine and other poisonous alkaloids, it seemed very probable that these products might be redissolved in the stomach and intestines, and thus be rendered capable of absorption; the virtue of tannin as an antidote to strychnine was, therefore, considered very doubtful.

With a view to subject this matter to a thorough examination, and to ascertain the efficacy of tannin in preventing and allaying the symptoms of poisoning by strychnine, Professor Kurzak made a series of experiments on rabbits and dogs. At the end of his interesting and highly important memoir, he states that the results of his investigation permit him to draw the following conclusions:—

1. *Tannin*, if administered in time, is an excellent *chemical antidote to strychnine.*

2. The doubt, whether the precipitate formed by tannin in a solution of strychnine, although insoluble in water, would not be redissolved by the gastric and intestinal juice, and the strychnine thus reobtain its poisonous properties, is solved by these experiments on rabbits and dogs in a complete and highly gratifying manner.

3. The successful results in dogs and rabbits justify the expectation that *tannin would suspend the poisonous action of strychnine also in man*, even in cases where the evacuation of the tannate of strychnine, formed in the stomach could not be accomplished.

4. These experiments show that *twenty to twenty-five times the quantity of tannin is required in order to suspend the poisonous action of strychnine.* In cases of poisoning it will be, however, advisable to administer a relatively larger proportion, as a part

of the antidote will be absorbed by the usual contents of the stomach, particularly by gelatine.

5. As tannin has proved to be an antidote to nitrate of strychnia, which is much more soluble in water, there is so much greater reason to hope that it will be successful in poisoning by pure strychnia which dissolves in water with great difficulty.

6. *The same successful result* is to be expected from its administration in poisoning by the hard and tough *nux vomica*, which imparts the poison to aqueous fluids, but gradually and not very rapidly.

7. Tannin is a so much more valuable antidote in poisoning by strychnine, as *galls* in which it is contained can be readily procured, and thus be administered without much loss of time. They are easily reduced to a powder, which is given mixed with water. Another advantage is obtained by the vomiting which it is liable to produce. In the mean time, an *infusion* or *decoction* of powdered galls may be prepared.

On an average, Turkish galls contain fifty, the Illyrian galls twenty per cent. of tannin. At least one drachm of the former and two drachms and a half of the latter are therefore required to neutralize one grain of strychnine introduced into the stomach, but in general, especially if there is vomiting, a much larger quantity should be administered.

8. Another readily obtained substance containing tannin is *Chinese tea*, the efficacy of which, in poisoning by strychnine, is confirmed by our experiments. But these experiments (VII. and VIII.) have also shown that, in a decoction of tea-leaves, we cannot count upon the whole amount of tannin contained in them. In poisoning by a larger dose, it would therefore be necessary to administer so large an amount of green tea that the antidote itself might produce poisonous effects. One decigramme (1.3 grain) of nitrate of strychnine requires, as our experiments prove, ten drachms (600 grains, 40 teaspoonfuls) of green tea, which, according to Peligot's analysis, contain about fifteen grains of caffein. Tea is therefore applicable only in poisoning by smaller doses, but may otherwise be useful as adjuvant.

9. The efficacy of *roasted coffee* as chemical antidote to strychnine seemed to be much inferior. The amount of *caffeo-tannic acid* contained in coffee is, according to Payen, 3.5 to 5.0 per cent. But our experiments (IX., X., XI.) show that the decoction evidently contains a much smaller quantity of undecomposed tannic acid than this per-centage would justify us in assuming. The decoction of 180 grains of roasted Cuba coffee (being adequate to 200 grains of the raw coffee, which should contain at least six grains of tannic acid) produced, according to the ninth experiment, merely a delay and diminution of the poisonous effect of 0.13 grain of nitrate of strychnine. In the tenth and eleventh experiments, 300 grains of raw coffee, which weighed, after roasting, 267 and 264 grains, and should have contained at least nine grains of tannic acid, had furnished a decoction which, as antidote to 0.13 grain of strychnine, was nearly inert, only delaying the appearance of the symptoms for a little while.

10. From *unroasted coffee*, so inconsiderable an amount of tannin is extracted, by boiling, that the employment of its decoction for our purpose is out of the question.

11. *Oak bark* (of Quercus robur and Q. pedunculata) contains, according to Gerber, 8.5 per cent. of tannic acid, and imparts it readily to aqueous fluids. It deserves attention in poisoning by strychnine so much the more, as it can be procured without much delay, especially in the country. What has been said about the administration of galls equally applies to the use of the powder and decoction of this bark.

12. On account of their frequent occurrence and the large amount of tannin they contain, we have to mention in this connexion: *acorns* (from Quercus robur and Q. pedunculata) with 9 per cent., the *bark of the horse-chesnut* with 8 per cent., *willow bark* with 5½ per cent., and *the green hull of walnuts*. The *radix tormentillæ* (with 17 per cent.), *rad. caryophyllatæ* (with 31 per cent.), and *rad. bistortæ*, are still richer in tannin, but can rarely be procured without much loss of time.

13. The solubility of the precipitate produced by tannin in a solution of strychnine, by *acetic*, *citric*, and *tartaric acid* (vide experiments with the same), show the necessity of avoiding vegetable acids during the treatment of poisoning by strychnine with tannic acid.

14. The same applies to the internal use of *alcohol* and *alcoholic remedies*.

15. The reported experiments with rabbits have sufficiently proved that more

active voluntary movements excite the spasms usually produced by strychnia, even when they otherwise would not have made their appearance. In treating cases of poisoning by strychnine, *it is therefore highly important to prohibit as much as possible all voluntary movements, and to avoid violent excitement of any other kind.—Zeitschrift der K. K. Gesellschaft der Aerzte zu Wien*, March 12, 1860.

PRODUCTION OF OPIUM IN FRANCE.

As the cultivation of the Opium Poppy for the purpose of obtaining opium, and for its seeds, is now exciting much attention in France, we subjoin a summary, from the *Journal de Chimie Médicale*, of the more important conclusions which have been arrived at by our neighbours upon this subject. Although the amount of morphia stated to have been obtained, in some cases, from the opium is, no doubt, over estimated, still the experiments which have been for the last few years carried on in France, show satisfactorily that opium of excellent quality may be commonly obtained from plants there cultivated:—

"M. Bénard, Professor in the School of Medicine at Amiens, and M. Collas, Pharmacien of Paris, have continued the researches they commenced in 1855, on the production of indigenous opium. Their experiments were made in the department of La Somme, where the cultivation of the poppy is pursued over a large area. The information there gained may serve as a guide to the pharmacien in the very numerous localities where the poppy is now cultivated. They prove beyond doubt that the production of the seed, and of opium, may be carried on together without the one injuring the other.

"It is not necessary to enter into details upon the cultivation of the poppy. We note only, that it is found most advisable, both to facilitate the keeping of the ground in order, as well as for the collection of the opium—that the seed should be sown in rows, at intervals of from twenty to thirty centimetres (from about eight inches to nearly a foot).

"In the department of La Somme alone, 12,702 hectares (about 31,388 acres) were set apart in 1857 for the cultivation of the poppy; and 140,000 hectolitres (about 385,168 bushels) of seed were collected. The total value of this seed was 4,480,000 francs, which gives an average of 352 francs (about £14 1*s.* 6*d.* per hectare), that is, about £5 13*s.* 6*d.* per acre.

"The value of the opium crop is on the increase. The expenses of extraction vary from 20 to 30 francs per kilogramme for dry and marketable opium. The price of sale varies from 70 to 75 francs, at a standard of 10 per cent. of morphia.* Two kilogrammes (nearly 4½ lbs. avoir.) of the milky juice containing opium yield about one kilogramme of dry opium; two to three kilogrammes are obtained from one hectare. The value of the opium produced on an average per hectare, would be 150 francs (£6), that is, about £2 8*s.* per acre. This, in the department of La Somme alone, would leave the cultivators 1,905,000 francs. This value would be in addition to that of the seed. If this speculation were carried on in all the departments where the poppy is cultivated, it would produce a considerable sum, and would meet the requirements of French pharmacy.

"The mode of extracting the juice is substantially the same as that pursued in the East, and its sale is easy.†

"Upon the whole, it has been now established:—

"1st. That the time for experiments has passed.

"2nd. That French opium may be placed, as to quality, by the side of the best opiums from the Levant; the chances of adulteration being much greater for the latter.

"3rd. That its extraction is lucrative and easy.

"By encouraging this new production, Government would render service to the country population. Women and children are more apt at this work than men.

* MM. Bénard and Deschamps assert that they have found from 16 to 22 per cent. of morphia in indigenous opium.

† M. Bénard, at Amiens, and M. Collas, at Paris, have intimated to the cultivators of La Somme, that all the opium which they collect will be received by them, at the price of 60 to 80 francs per kilogramme, according to its quality.

The most effectual means of encouragement would be to propagate information upon the subject, and to show the advantages to be derived from it, by every public means, in the departments where the poppy is cultivated. It would be sufficient to engage instructed teachers to practise their pupils some hours for a few days in incising the capsules and collecting the juice. This time, otherwise lost by so many, would thus be utilized, and rewarded with immediate profit. As soon as the incision is made, the juice flows out and may be collected. In twenty-four hours it is dry; two grammes alone are worth fifteen centimes. A skilful labourer would collect from 50 to 100 grammes per day. The stock of tools required for the extraction is of the simplest kind: a knife, worth 60 centimes, and one or two plates, would be all that was necessary.

"The operation is most easy; it requires no dexterity; and it may be trusted, says MM. Bénard and Collas, to the most inexperienced hands."

LITHIUM AND ITS SALTS.

This metal was discovered in 1817, by Arfwedson, in the mineral petalite. It exists also in spodumen, and lepidolite, and as a carbonate in many of the continental medicinal springs, viz., Carlsbad, Marienbad, Kreuznach, Aix-la-Chapelle, Kissingen, Ems, Tiplitz, Bilin, Vichy, &c. Though so long known it was not introduced as a remedy for any specific disease until Dr. Garrod wrote his elaborate treatise on gout, &c., in which complaint he attributes to carbonate of lithia wonderful and marvellous properties.

Lithium may be obtained, by galvanic action, from hydrated oxide, Li O + H O.

Davy ascribes to this metal analogous properties to sodium, and recent experiments tend to verify that assertion. In appearance it closely resembles silver, being of a beautiful white colour. On exposure to the atmosphere it becomes converted into oxide. Its specific gravity is less than that of water, and its atomic, or uniting proportion does not exceed seven on the hydrogen scale.

Oxide of Lithia.—Lithia is separated from powdered triphyllin, the most abundant mineral containing it, by digestion to solution in hydrochloric acid, and peroxidizing the iron with a little nitric acid. Dilute the liquid with water, and then add an excess of ammonia to precipitate the phosphoric acid and sesquioxide of iron. Through the ammoniacal solution pass sulphuretted hydrogen, to separate magnesia, filter, evaporate to dryness, calcine the residue to expel ammoniacal salts, and dissolve the chloride of lithium in alcohol. Upon the addition of an excess of carbonate of ammonia, a carbonate of lithia precipitates after a time, and must be collected on a filter, and washed with alcohol of 0.80 per cent. This carbonate, when finally powdered and boiled in a large quantity of water, becomes dissolved, and upon the addition of lime is decarbonated. The filtered solution, upon evaporation, yields hydrated oxide of lithia.—(*Booth.*)

This preparation is insoluble, or, at least, nearly so, and remains unaltered by all external actions. It possesses a disagreeable caustic taste; it is reactionary alkali, and readily attacks platinum.

Chloride of Lithia appears in crystallized cakes, and is soluble in alcohol and water. Unlike oxide of lithia, it is deliquescent on exposure.

Sulphuret of Lithia is soluble in water and alcohol, and eminently pyrophoric.

Sulphate of Lithia exists as a crystallized body, and remains unalterable by exposure. Its formulæ is Li O S O_3. It is soluble in water, and nearly insoluble in alcohol. With sulphate of soda it forms a double salt, Na O S O_3+Li O S O_3+6 H O.

Phosphates of Lithia.—The neutral phosphate of this base, 2 Li O P O_5, is almost insoluble. The bi-phosphate, Li O P O_5 is very soluble in water, and crystallizable. With phosphate of soda it forms a double salt, soluble in 1400 parts of water at 59°, and in 950 parts at 210°. It is insoluble in all liquids containing phosphate. It is a white powder, and has for its formulæ 2 Na O P O_5+2 Li O P O_5.

Oxalate of Lithia.—2 C_2 O_3 Li O+H O, is a neutral crystallizable substance, soluble in water, unchanged on exposure, but decomposed by heat. The binoxalate is also a crystalline body, but less soluble than the former.

Nitrate of Lithia—a powder, anhydrous, deliquescent, fusible, and soluble.

All the salts of lithia impart a red colour to flame, and to distinguish them from

the salts of strontia in this respect, Chapman heats the suspected substance in a microcosm of chloride of barium, which prevents chloride of strontium from tinging the flame. If, while at the point of the inner flame, no redness is apparent, lithia is absent, and the red first obtained from the mineral *per se* is due to strontia.—*Dublin Hospital Gazette.*

ON THE ELECTRIC SILK-LOOM.

BY PROFESSOR FARADAY, D.C.L., F.R.S.

(*Abstract of a Lecture Delivered at the Royal Institution, June* 8, 1860.)

"ILLUSTRANS COMMODA VITÆ,"* the motto of the Royal Institution, was made the ruling principle on this the last evening of the season; an account being given of the application by M. Bonelli of electricity, to the service of the figure weaving-loom. The astonishing condition of perfection to which M. Jacquard had brought the silk-loom, so that artists of the highest rank could not without minute inspection distinguish its results from the most perfect engraving, and the manner in which he taught the weaver to construct a series of cards, and then to use them automatically, so as to produce as often as he pleased the design which they represented, are well known. Any effect of pattern, either simple or complicated, which is produced in the woven fabric depends upon the manner in which the threads of the warp are separated before the weft is thrown, and the successive rearrangements of the warp threads which are brought about each time the shuttle is passed. A single thread of the weft therefore represents an element of the design; and in the Jacquard loom, each of these required a card pierced in a certain order, which being brought against the ends of a set of horizontal rods, allowed some to remain undisturbed, whilst others were pushed on one side. By the action of the pedal the warp threads associated with the undisturbed rods were raised, and those belonging to the displaced rods were left unmoved; and to do this rightly, a separate pierced card was required for every thread that crossed the warp within the extent of the pattern. Frequently some thousands of cards are needed, and for the production of a woven portrait of M. Jacquard, in black and white silk, as many as 24,000 were employed.

After a design has been decided upon, it has to be converted into these cards, one for each thread of the weft included in the design; the preparation and piercing of them requires much care and time, after which they have to be linked together as an endless chain in their proper order. It is to replace this part of the weaving arrangements that Mr. Bonelli has applied his attention, and the peculiar power of electricity. Instead of the many pierced cards, he has but one card, or rather its equivalent, a convertible plate of brass; which being pierced with the full number of holes required (which in the loom in action was 400) can have these holes either stopped or left open so as to represent by its successive changes of condition the successive cards of the Jacquard series. To obtain this effect, tin foil is attached strongly to paper, so as to form a compound sheet. The design is then drawn upon the metallic surface with black bituminous varnish, and the sheet is made into an endless band, which being placed upon a roller, and kept in its position by stops, moves as the roller moves, being carried forward by its motion. A set of teeth rests upon the top of this roller, touching the pattern in a line; they are made of thin brass plate, so thin that 400 of them do not occupy more than 15 or 17 inches, *i.e.* the width of the design on the roller; yet so separate that each is insulated from its neighbour by little interposed teeth of ivory; and so large and therefore weighty as to fall and rest upon the pattern, making good electrical contact where the tin foil is exposed, but being insulated where the bituminous pattern intervenes.

Behind these teeth are 400 small electro-magnets fixed in a framework, parallel to each other, and insulated. The fine covered wires which constitute their helices are connected at one set of ends with the teeth just described, each with a tooth; whilst the other ends are brought together and made fast to one metallic plate and wire. Tracing this wire onwards, it comes to an interruptor or contact-maker, from whence the metallic communication proceeds to a screw appointed to communicate with one

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* Lucretius, iii., 2.

end of a five-celled Bunsen battery, the other end of which communicates with a screw near the former. This screw has a wire proceeding from it to two insulated teeth, like the teeth bearing upon the pattern, but heavier; and these rest upon the uncovered edges of the tin foil at the sides of the pattern, so as to keep up a constant electric communication with it. By simple but perfect and secure mechanical arrangements, the following movements and results take place in this part of the apparatus. As the pedel descends under the weaver's foot at a certain time, the 400 teeth descend upon the pattern; then the circuit is completed at the interruptor in the single wire; the electric current passing through that wire is divided into as many portions as there are teeth touching the metal in the line of pattern under realization; it makes all the electro-magnets surrounded by these wires active, leaving the others non-magnetic; and then, as the foot is raised and the movements return in their course, the interruptor is first separated, which, causing all current to cease, the magnets lose their power, the teeth are raised from the pattern; and then the cylinder carrying it moves forward just so much as to give the new line of pattern for the teeth to search out electrically (the next time they descend), which corresponds to the next cast of the weft thread. Because the pattern never moves, whilst it is in contact with the teeth, it is not cut or worn by them, because the current is made by the interruptor after the teeth are in contact, and before they are separated, no fusion or burning of the metal occurs at the teeth; and because there is a tongue-like wiper or brush, which at the right time passes under the teeth, sustains them, and from off which they rub on to the pattern, there is never any want of cleanliness or of contact there.

Associated with these 400 magnets, and in the same line with them, are 400 cylinders of soft iron, called pistons; they are carried in a frame which moves to and fro horizontally between the magnets and the horizontal rods belonging to the suspensions of the warp threads; and they move towards the magnets at a time so adjusted as to coincide with the passage of the electricity round its circuit: they find therefore some of the magnets excited, because their teeth touch the metal of the pattern; and, as the box of pistons begins to return before the current is interrupted, such of the pistons as have touched excited magnets are retained or held back, whilst the others have returned in their course: the pistons, therefore, are divided into two intermixed groups, of which the one group is perhaps half an inch behind the other. Now comes in the action of the perforated brass plate, which is to be converted for the time into the equivalent of the particular Jacquard card required. It is a vertical plate, associated with the extremities of the pistons furthest from the electro-magnets: it can move up and down to a small extent: it is pierced by 400 circular holes. The 400 pistons have each a head or button, which can pass freely each through its correspondent hole when the plate is up, but is stopped at the hole when the plate is down, and then effectually closes it. Now the time is so adjusted, that when the box of pistons has moved so far forward as to cause separation of the two groups, the plate descends, and by locking such of the heads as belong to the unretained group, fills the correspondent holes, whilst the heads of the retained group being already behind their holes, have left them open; and so the Jacquard plate is formed, and moving a little further it acts on the horizontal rods before mentioned, and having by that arranged the suspenders of the warp threads, it then goes back, or towards the electro-magnets, to take up, under the influence of the currents of electricity through the selecting teeth, the new arrangement of apertures required for the next cast of the weft thread.

The use of electricity, for the purpose of reading off the design and conveying it into the loom, involved many peculiarities, conditions, and difficulties. These were considered; and the manner in which they were either turned to advantage or overcome, was illustrated by large and separate experiments.

HOW TO FORETEL WEATHER.

The following manual of the barometer has been compiled by Rear-Admiral Fitzroy, and published by the Board of Trade:—

Familiar as the practical use of weather-glasses is, at sea as well as on land, only those who have long watched their indications and compared them carefully are

really able to conclude more than that the rising glass* usually foretels less wind or rain, a falling barometer more rain or wind, or both ; a high one fine weather, and a low the contrary. But useful as these general conclusions are in most cases, they are sometimes erroneous, and then remarks may be rather hastily made, tending to discourage the inexperienced.

By attention to the following observations (the results of many years' practice and many persons' experience), any one not accustomed to use a barometer may do so without difficulty.

The barometer shows whether the air is getting lighter or heavier, or is remaining in the same state. The quicksilver falls as the air becomes lighter, rises as it becomes heavier, and remains at rest in the glass tube while the air is unchanged in weight. Air presses on everything within about 40 miles of the world's surface like a much lighter ocean, at the bottom of which we live, not feeling its weight because our bodies are full of air,† but feeling its currents, the winds. Towards any place from which the air has been drawn by suction,‡ air presses with a force or weight of nearly 15lbs. on a square inch of surface. Such a pressure holds the limpet to the rock when, by contracting itself, the fish has made a place without air§ under its shell. Another familiar instance is that of the fly, which walks on the ceiling, with feet that stick. The barometer tube, emptied of air, and filled with pure mercury, is turned down into a cup or cistern containing the same fluid, which feeling the weight of air, is so pressed by it as to balance a column of about 30 inches (more or less) in the tube, where no air presses on the top of the column.

The words on scales of barometers should not be so much regarded for weather indications as the rising or falling of the mercury, for if it stand at "changeable" and then rise towards "fair," it presages a change of wind or weather, though not so great as if the mercury had risen higher; and, on the contrary, if the mercury stand above "fair" and then fall, it presages a change, though not to so great a degree as if it had stood lower; besides which, the direction and force of wind are not in any way noticed. It is not from the point at which the mercury may stand that we are alone to form a judgment of the state of the weather, but from its rising or falling, and from the movements of immediately preceding days as well as hours, keeping in mind effects of change of direction and dryness or moisture, as well as alteration of force or strength of wind.

By a thermometer the weight of air is not shown. No air is within the tube. None can get in. But the bulb of the tube is full of mercury, which contracts by cold and swells by heat, according to which effect the thread of metal in the small tube is drawn down or pushed up so many degrees, and thus shows the temperature.‖

If a thermometer have a piece of linen round the bulb, wetted enough to keep it damp by a thread or wick dipping into a cup of water, it will show less heat than a dry one, in proportion to the dryness of the air and quickness of drying.¶ In very damp weather, with or before rain, fog, or dew, two such thermometers will be nearly alike.

For ascertaining the dryness or moisture of air, the readiest and surest method is the comparison of two thermometers, one dry, the other just moistened and kept so. Cooled by evaporation as much as the state of the air admits, the moist (or wet) bulb thermometer shows a temperature nearly equal to that of the other one when the atmosphere is extremely damp or moist; but lower at other times, in proportion to the dryness of air and consequent evaporation—as far as 12° or 15° in this climate, 20° or even more elsewhere. From 4° to 8° of difference is usual in England, and about 7° is considered healthy for inhabited rooms.

Briefly, the barometer shows weight or pressure of the air; the thermometer,

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* Glass, barometer, column, mercury, quicksilver, or hand.
† Or atmosphere, or the atmospheric fluid which we breathe.
‡ Or exhaustion.
§ A vacuum.
‖ Thirty-two degrees is the point at which water begins to freeze, or ice to thaw.
¶ Evaporation.

heat and cold, or temperature; and the wet thermometer, compared with a dry one, the degree of moisture or dampness.*

It should always be remembered that the state of the air foretels coming weather, rather than shows the weather that is present—an invaluable fact too often overlooked; that the longer the time between the signs and the change foretold by them, the longer such altered weather will last; and, on the contrary, the less the time between a warning and a change, the shorter will be the continuance of such foretold weather.

To know the state of the air, not only barometer and thermometers should be watched, but the appearances of the sky should be vigilantly noticed.

If the barometer has been about its ordinary height, say near 30 inches (at the sea level),† and is steady, or rising, while the thermometer falls, and dampness becomes less, north-westerly, northerly, or north-easterly wind, or less wind, less rain or snow may be expected.

On the contrary, if a fall takes place with a rising thermometer and increased dampness, wind and rain may be expected from the south-eastward, southward, or south-westward.

A fall with a low thermometer foretels snow.

Exceptions to these rules occur when a north-easterly wind, with wet (rain, hail, or snow) is impending, before which the barometer often rises (on account of the direction of the coming wind alone), and deceives persons who from that sign only (the rising) expect fair weather.

When the barometer is rather below its ordinary height, say down to near 29½ inches (at the sea level), a rise foretels less wind, or a change in its direction towards the northward, or less wet; but when it has been very low, about 29 inches, the first rising usually precedes or indicates strong wind; at times heavy squalls from the north-westward, northward, or north-eastward,—after which violence a gradually rising glass foretels improving weather if the thermometer falls; but, if the warmth continue, probably the wind will back (shift against the sun's course), and more southerly, or south-westerly wind will follow, especially if the barometer rise is sudden.

The most dangerous shifts of wind, or the heaviest northerly gales, happen soon after the barometer first rises from a very low point; or, if the wind veers gradually, at some time afterwards.

Indications of approaching changes of weather and the direction and force of winds are shown less by the height of the barometer than by its falling or rising. Nevertheless, a height of more than 30 (30.0) inches (at the level of the sea) is indicative of fine weather and moderate winds; except from east to north, occasionally.

The barometer is said to be falling when the mercury in the tube is sinking, at which time its upper surface is sometimes concave or hollow; or when the hand moves to the left. The barometer is rising when the mercurial column is lengthening; its upper surface being convex or rounded, or when the hand moves to the right.

A rapid rise of the barometer indicates unsettled weather; a slow movement the contrary; as likewise a steady barometer, which, when continued, and with dryness, foretels very fine weather.

A rapid and considerable fall is a sign of stormy weather and rain (or snow). Alternate rising and sinking indicates unsettled and threatening weather.

The greatest depressions of the barometer are with gales from S.E., S., or S.W.; the greatest elevations, with wind from N.W., N., or N.E., or with calm.

Though the barometer generally falls with a southerly, and rises with a northerly wind, the contrary sometimes occurs; in which cases, the southerly wind is usually dry with fine weather, or the northerly wind is violent and accompanied by rain, snow, or hail; perhaps with lightning.

When the barometer sinks considerably, much wind, rain (perhaps with hail), or

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* The two thus combined making a hygrometer; for which some kinds of hair, grass, or seaweed may be a makeshift.

† It differs, or stands lower, about a tenth of an inch for each 100 feet of height directly upwards, or vertically, above the sea; its average height being 29.94 inches at the mean sea level in England. Allowances must therefore be made for barometers on high land or in buildings.

snow will follow ; with or without lightning. The wind will be from the northward, if the thermometer is low (for the season)—from the southward, if the thermometer is high. Occasionally a low glass is followed or attended by lightning only, while a storm is beyond the horizon.

A sudden fall of the barometer, with a westerly wind, is sometimes followed by a violent storm from N.W., or N., or N.E.

If a gale sets in from E. or S.E., and the wind veers by the S., the barometer will continue falling until the wind is near a marked change, when a lull may occur ; after which the gale will soon be renewed, perhaps suddenly and violently, and the veering of the wind towards the N.W., N., or N.E., will be indicated by a rising of the barometer with a fall of the thermometer.

Three causes (at least)* appear to affect a barometer:—

1. The direction of the wind—the north-east wind tending to raise it most—the south-west to lower it the most, and wind from points of the compass between them proportionally as they are nearer one or the other extreme points.

N E. and S.W. may therefore be called the wind's extreme bearings (rather than poles).

The range or difference of height shown, due to change of direction only, from one of these bearings to the other (supposing strength or force, and moisture to remain the same), amounts in these latitudes to about half an inch (as read off).

2. The amount—taken by itself—of vapour, moisture, wet, rain, or snow in the wind, or current of air (direction and strength of wind remaining the same), seems to cause a change amounting in an extreme case to about half an inch.

3. The strength or force alone of wind, from any quarter (moisture and direction being unchanged), is preceded or foretold by a fall or rise, according as the strength will be greater or less, ranging in an extreme case to more than two inches.

Hence, supposing three causes to act together—in extreme cases—the height would vary from near 31 inches (30.9) to about 27 inches (27.0), which has happened, though rarely (and even in tropical latitudes).

In general, the three causes act much less strongly, and are less in accord; so that ordinary varieties of weather occur much more frequently than extreme changes.

Another general rule requires attention; which is, that the wind usually appears to veer, shift, or go round with the sun (right-handed or from left to right),† and that when it does not do so, or backs, more wind or bad weather may be expected instead of improvement.

It is not by any means intended to discourage attention to what is usually called "weather wisdom." On the contrary, every prudent person will combine observation of the elements with such indications as he may obtain from instruments ; and will find that the more accurately the two sources of foreknowledge are compared and combined, the more satisfactory their results will prove.

A barometer begins to rise considerably before the conclusion of a gale, sometimes even at its commencement. Although it falls lowest before high winds, it frequently sinks very much before heavy rain. The barometer falls, but not always, on the approach of thunder and lightning.‡ Before and during the earlier part of settled weather it usually stands high and is stationary, the air being dry.

Instances of fine weather, with a low glass, occur, however, rarely, but they are always preludes to a duration of wind or rain, if not both.

After very warm and calm weather, a storm or squall, with rain, may follow ; likewise at any time when the atmosphere is heated much above the usual temperature of the season.

Allowance should invariably be made for the previous state of the glasses during some days, as well as some hours, because their indications may be affected by distant causes, or by changes close at hand. Some of these changes may occur at a greater or less distance, influencing neighbouring regions, but not visible to each observer whose barometer feels their effect.

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* Electrical effects are yet uncertain.

† With watch-hands in the northern hemisphere ; but the contrary in south latitude. This, however, is only apparent; the wind is actually circulating in the contrary direction.

‡ Thunder-clouds rising from north eastward, against the wind, do not usually cause a fall of the barometer.

There may be heavy rains or violent winds beyond the horizon, and the view of an observer, by which his instruments may be affected considerably, though no particular change of weather occurs in his immediate locality.

It may be repeated that the longer a change of wind or weather is foretold before it takes place, the longer the presaged weather will last, and, conversely, the shorter the warning the less time, whatever causes the warning, whether wind or fall of rain or snow, will continue.

Sometimes severe weather from the southward, not lasting long, may cause no great fall, because followed by a duration of wind from the northward, and at times the barometer may fall with northerly winds and fine weather, apparently against these rules, because a continuance of southerly wind is about to follow. By such changes as these one may be misled and calamity may be the consequence, if not duly forewarned.

A few of the more marked signs of weather, useful alike to seaman, farmer, and gardener, are the following:—

Whether clear or cloudy—a rosy sky at sunset presages fine weather; a red sky in the morning bad weather, or much wind (perhaps rain); a grey sky in the morning, fine weather; a high dawn, wind; a low dawn, fair weather.*

Soft looking or delicate clouds foretel fine weather, with moderate or light breezes; hard edged, oily looking clouds, wind. A dark, gloomy, blue sky is windy; but a light, bright blue sky indicates fine weather. Generally, the softer clouds look the less wind (but perhaps, more rain) may be expected; and the harder, more "greasy," rolled, tufted, or ragged, the stronger the coming wind will prove. Also, a bright yellow sky at sunset presages wind; a pale yellow, wet:—and thus by the prevalence of red, yellow, or grey tints, the coming weather may be foretold very nearly, indeed, if aided by instruments, almost exactly.

Small inky-looking clouds foretel rain:—light scud clouds driving across heavy masses show wind and rain; but, if alone, may indicate wind only.

High upper clouds crossing the sun, moon, and stars, in a direction different from that of the lower clouds, or the wind then felt below, foretel a change of wind.

After fine clear weather, the first signs in the sky of a coming change are usually light streaks, curls, whisps, or mottled patches of white distant cloud, which increase, and are followed by an overcasting of murky vapour that grows into cloudiness. This appearance, more or less oily, or watery, as wind or rain will prevail is an infallible sign.

Usually the higher and more distant such clouds seem to be,—the more gradual, but general, the coming change of weather will prove.

Light, delicate, quiet tints or colours, with soft, undefined forms of clouds, indicate and accompany fine weather; but gaudy or unusual hues, with hard, definitely-outlined clouds, foretel rain, and probably strong wind.

Misty clouds forming or hanging on heights show wind and rain coming—if they remain, increase, or descend. If they rise or disperse, the weather will improve or become fine.

When sea-birds fly out early, and far to seaward, moderate wind and fair weather may be expected; when they hang about the land, or over it, sometimes flying inland, expect a strong wind with stormy weather. As many creatures besides birds are affected by the approach of rain or wind, such indications should not be slighted by an observer who wishes to foresee weather.

There are other signs of a coming change in the weather known less generally than may be desirable, and therefore worth notice; such as when birds of long flight, rooks, swallows, or others, hang about home, and fly up and down, or low—rain or wind may be expected. Also, when animals seek sheltered places, instead of spreading over their usual range; when pigs carry straws to their sties; when smoke from chimneys does ascend readily (or straight upwards during calm), an unfavourable change is probable.

Dew is an indication of fine weather; so is fog. Neither of these two formations

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* A "high dawn" is when the first indications of daylight are seen above a bank of clouds. A "low dawn" is when the day breaks on or near the horizon, the first streaks of light being very low down.

occurs under an overcast sky, or when there is much wind. One sees fog occasionally rolled away, as it were, by wind—but seldom or never formed while it is blowing.

Remarkable clearness of atmosphere near the horizon, distant objects, such as hills, unusually visible, or raised (by refraction), and what is called "a good hearing day," may be mentioned among the signs of wet, if not of wind, to be expected.

More than usual twinkling of the stars, indistinctness or apparent multiplication of the moon's horns, halos, "wind-dogs,"* and the rainbow, are more or less significant of increasing wind, if not approaching rain, with or without wind.

Near land, in sheltered harbours, in valleys, or over low ground, there is usually a marked diminution of wind, during part of the night, and a dispersion of clouds. At such times an eye on an overlooking height may see an extended body of vapour below (rendered visible by the cooling of night) which seems to check the wind.

Lastly, the dryness or dampness of the air, and its temperature (for the season), should always be considered, with other indications of change, or continuance of wind and weather.

THE USE AND ABUSE OF TOBACCO.

TO THE EDITOR OF THE TIMES.

Sir,—Having been applied to some time since to join in a petition to the House of Commons that they would appoint a committee to inquire into the effects produced by the prevailing habit of tobacco-smoking, I declined to do so; first, because it did not appear to me that such a committee would be very competent to discuss a question of this kind; and, secondly, because, even if they were so, I did not see that it would be possible for Parliament to follow up by any act of legislation the conclusions at which they might have arrived. Nevertheless, I am ready to admit that the subject is one of no trifling importance, and well worthy the serious consideration of any one who takes an interest in the present and future well-being of society. From these considerations it is that I now venture to address to you the following observations.

The empyreumatic oil of tobacco is produced by distillation of that herb at a temperature above that of boiling water. One or two drops of this oil (according to the size of the animal) placed on the tongue will kill a cat in the course of a few minutes. A certain quantity of the oil must be always circulating in the blood of an habitual smoker, and we cannot suppose that the effects of it on the system can be merely negative. Still, I am not prepared to subscribe to the opinion of those who hold that, under all circumstances, and to however moderate an extent it be practised, the smoking of tobacco is prejudicial. The first effect of it is to soothe and tranquillize the nervous system. It allays the pains of hunger, and relieves the uneasy feelings produced by mental and bodily exhaustion. To the soldier who has passed the night in the trenches before a beleaguered town, with only a distant prospect of breakfast when the morning has arrived; to the sailor, contending with the elements in a storm; to the labourer, after a hard day's work; to the traveller in an uncultivated region, with an insufficient supply of food, the use of a cigar or a tobacco-pipe may be not only a grateful indulgence, but really beneficial. But the occasional use of it under such circumstances is a very different matter from the habit of constant smoking which prevails in certain classes of society at the present day.

The effects of this habit are, indeed, various, the difference depending on difference of constitution, and difference in the mode of life otherwise. But, from the best observations which I have been able to make on the subject, I am led to believe that there are very few who do not suffer harm from it, to a greater or less extent. The earliest symptoms are manifested in the derangement of the nervous system. A large proportion of habitual smokers are rendered lazy and listless, indisposed to bodily, and incapable of much mental exertion. Others suffer from depression of the

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* Fragments or pieces (as it were) of rainbows (sometimes called "wind-galls") seen on detached clouds.

spirits, amounting to hypochondriasis, which smoking relieves for a time, though it aggravates the evil afterwards. Occasionally there is a general nervous excitability, which though very much less in degree, partakes of the nature of the *delirium tremens* of drunkards. I have known many individuals to suffer from severe nervous pains, sometimes in one, sometimes in another part of the body. Almost the worst case of neuralgia that ever came under my observation was that of a gentleman who consulted the late Dr. Bright and myself. The pains were universal, and never absent; but during the night they were especially intense, so as almost wholly to prevent sleep. Neither the patient himself nor his medical attendant had any doubts that the disease was to be attributed to his former habit of smoking, on the discontinuance of which he slowly and gradually recovered. An eminent surgeon, who has a great experience in ophthalmic diseases, believes that, in some instances, he has been able to trace blindness from amaurosis to excess in tobacco-smoking; the connexion of the two being pretty well established in one case by the fact that, on the practice being left off, the sight of the patient was gradually restored. It would be easy for me to refer to other symptoms indicating deficient power of the nervous system to which smokers are liable; but it is unnecessary for me to do so; and, indeed, there are some which I would rather leave them to imagine for themselves than undertake the description of them myself in writing.

But the ill effects of tobacco are not confined to the nervous system. In many instances there is a loss of the healthy appetite for food, the imperfect state of the digestion being soon rendered manifest by the loss of flesh and the sallow countenance. It is difficult to say what other diseases may not follow the imperfect assimilation of food continued during a long period of time. So many causes are in operation in the human body which may tend in a greater or less degree to the production of organic changes in it, that it is only in some instances we can venture to pronounce as to the precise manner in which a disease that proves mortal has originated. From cases, however, which have fallen under my own observation, and from a consideration of all the circumstances, I cannot entertain a doubt that, if we could obtain accurate statistics on the subject, we should find that the value of life in inveterate smokers is considerably below the average. Nor is this opinion in any degree contradicted by the fact that there are individuals who, in spite of the inhalation of tobacco-smoke, live to be old, and without any material derangement of the health; analogous exceptions to the general rule being met with in the case of those who have indulged too freely in the use of spirituous and fermented liquors.

In the early part of the present century tobacco-smoking was almost wholly confined to what are commonly called the lower grades of society. It was only every now and then that any one who wished to be considered as a gentleman was addicted to it. But since the war on the Spanish peninsula, and the consequent substitution of the cigar for the tobacco-pipe, the case has been entirely altered. The greatest smokers at the present time are to be found, not among those who live by their bodily labour, but among those who are more advantageously situated, who have better opportunities of education, and of whom we have a right to expect that they should constitute the most intelligent and thoughtful members of the community. Nor is the practice confined to grown-up men. Boys, even at the best schools, get the habit of smoking, because they think it manly and fashionable to do so; not unfrequently because they have the example set them by their tutors, and partly because there is no friendly voice to warn them as to the special ill consequences to which it may give rise where the process of growth is not yet completed, and the organs are not yet fully developed.

The foregoing observations relate to the habit of smoking as it exists among us at the present time. But a still graver question remains to be considered. What will be the result if this habit be continued by future generations? It is but too true that the sins of the fathers are visited upon their children and their children's children. We may here take warning from the fate of the Red Indians of America. An intelligent American physician gives the following explanation of the gradual extinction of this remarkable people:—One generation of them become addicted to the use of the firewater. They have a degenerate and comparatively imbecile progeny, who indulge in the same vicious habit with their parents. *Their* progeny is still more degenerate, and after a few generations the race ceases altogether. We

may also take warning from the history of another nation, who some few centuries ago, while following the banners of Solyman the Magnificent, were the terror of Christendom, but who since then, having become more addicted to tobacco-smoking than any of the European nations, are now the lazy and lethargic Turks, held in contempt by all civilized communities.

In thus placing together the consequences of intemperance in the use of alcohol and that in the use of tobacco, I should be sorry to be misunderstood as regarding these two kinds of intemperance to be in an equal degree pernicious and degrading.

The inveterate tobacco-smoker may be stupid and lazy, and the habit to which he is addicted may gradually tend to shorten his life and deteriorate his offspring, but the dram-drinker is quarrelsome, mischievous, and often criminal. It is under the influence of gin that the burglar and the murderer become fitted for the task which they have undertaken. The best thing that can be said for dram-drinking is, that it induces disease, which carries the poor wretch prematurely to the grave, and rids the world of the nuisance. But, unfortunately, in this, as in many other cases, what is wanting in quality is made up in quantity. There are checks on one of these evil habits which there are not on the other. The dram-drinker, or, to use a more general term, the drunkard, is held to be a noxious animal. He is an outcast from all decent society, while there is no such exclusion for the most assiduous smoker.

The comparison of the effects of tobacco with those of alcohol leads to the consideration of a much wider question than that with which I set out. In all ages of which we have any record mankind have been in the habit of resorting to the use of certain vegetable productions, not as contributing to nourishment, but on account of their having some peculiar influence as stimulants or sedatives (or in some other way) on the nervous system. Tobacco, alcohol, the Indian hemp, the kava of the South Sea Islanders, the Paraguay tea, coffee, and even tea, belong to this category. A disposition so universal may almost be regarded as an instinct, and there is sufficient reason to believe that, within certain limits, the indulgence of the instinct is useful. But we must not abuse our instincts. This is one of the most important rules which man, as a responsible being, both for his own sake and for that of others, is bound to observe. Even such moderate agents as tea and coffee, taken in excess, are prejudicial. How much more so are tobacco and alcohol, tending, as they do, not only to the degradation of the individual, but to that of future generations of our species.

If tobacco-smokers would limit themselves to the occasional indulgence of their appetite, they would do little harm either to themselves or others; but there is always danger that a sensual habit once begun may be carried to excess, and that danger is never so great as in the case of those who are not compelled by the necessities of their situation to be actively employed. For such persons the prudent course is to abstain from smoking altogether.

Trusting that you and your readers will excuse me for having occupied so large a space in your columns,

I am, Sir, your obedient servant,

August 27th. B. C. Brodie.

THE BRITISH MUSEUM.

Much discussion has taken place within the last three years as to the propriety, or otherwise, of removing the Natural History Collections from the British Museum, in order to find room for the increasing requirements of the other departments of that great national institution. We have always advocated in the strongest manner the retention of the Natural History Collections at their present home, and for the three following reasons, especially: thus, in the first place, on account of their central position, and consequent facility of reference by scientific and commercial men; secondly, from the great expense that would attend their removal, and the long time which would necessarily elapse before such collections could be again rendered available; and, thirdly, from the great injury which would most certainly accrue to the various specimens, however great the care bestowed upon them, by such removal. We were also further of opinion, that an institution dignified with the title of the British Museum should not alone be made the repository of collections which, more especially, belonged to the historian and antiquarian, but that it should

be a storehouse, as far as possible, of everything of interest to the man of science, literature, and art, in every department, and in every grade of life. Such being the views entertained and advocated by us, we are glad to find that the Select Committee appointed by the House of Commons to inquire how far, and in what way, it may be desirable to find increased space for the extension and arrangement of the various collections of the British Museum, and the best means of rendering them available for the promotion of science and art, have published their report, which, in the main, entirely accords with our ideas upon the subject. There is, however, one conclusion arrived at by the Committee from which we entirely dissent: thus, it had been suggested, that lectures should be given to the public at the Museum by competent professors of science and art, for the purpose of rendering the various collections as intelligible as possible, and thus to render it a great educational institution, as well as now, a consultative repertory to the man of science and art. The Committee have reported against this suggestion, but we cannot but think that such an idea could be carried out with great advantage, and that while, at the same time, the consultative repertory should remain as now, the leading feature of the institution, its educational value, should be prominently put forward. We believe that it would not be difficult in such a large collection, so to select specimens from the general mass, as to prevent injury and to interfere but little, if at all, with its value for reference and authentication of specimens by the man of science. We trust, therefore, that while the conclusions of the Committee may be generally adopted by Parliament, the portions which refer to the educational value of the British Museum may be considerably modified, and that it may be made available to all classes in every way in which it is capable

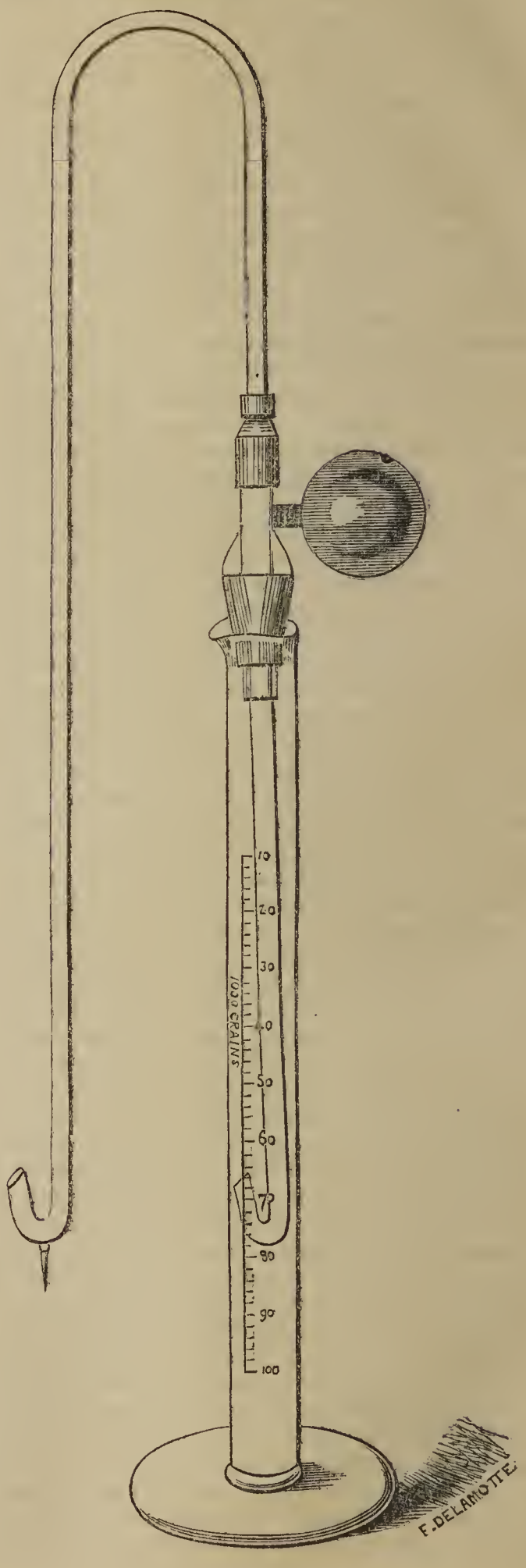
We subjoin a summary of the Report of the Select Committee, as follows:—

"The first point of the inquiry was the provision of additional space for the various collections; and, in connexion with it, the suggested removal of the natural history collections. The evidence taken was almost unanimous against the removal of the natural history collections, which are the most numerously visited. The Committee state that the removal would excite much dissatisfaction, not merely among a large portion of the inhabitants of the metropolis, but among the numerous inhabitants of the country who from time to time visit London by railway, and to whom the proximity of the British Museum to most of the railway termini, as compared with the distance of the localities to which it has been proposed to transport such collections, is of great practical importance. Similar evidence shows that the proposed removal of these collections from the British Museum has excited grave and general disapprobation in the scientific world, and that a memorial against it was signed by 114 persons, including many eminent promoters and cultivators of science in England, and presented to the Chancellor of the Exchequer in 1858. The report asserts the necessity of retaining these different collections in connexion with the library; and says that if they should be removed, the purchase of a special library of reference would be indispensable. The estimates of the expense of the construction of a new natural history museum, and the transfer of the collections to it, are next given. Of the three sites which have been proposed, one is a portion of the land in the neighbourhood of Kensington, belonging to the Royal Commissioners for the Exhibition of 1851; the second, the site of Burlington House; the third, a plot of ground near Victoria Street, Westminster. The cost of the first site would be £53,750; the site of Burlington House covers an area of only three acres, and the new Museum would require 5½ acres; in Victoria Street more than sufficient space might be obtained at the rate of £7000 per acre. Ground enough might also be obtained in the immediate vicinity of the present Museum, but at a cost of £240,000. The formation of a special library of reference for the natural history collections would be about £30,000, and the addition of all new works would be constantly required. The nation would have to support two librarians and a double staff of attendants. As to the building, according to the system of arranging the collections approved by Prof. Owen, who states that 'varieties are now as important as species,' and that all comparisons are best made by 'stuffed specimens,' the edifice would cover ten acres, if containing galleries on one floor; if on two floors, five acres. With this eminent exception, all the other scientific naturalists who have been examined, including the present keepers of all the departments, think that

an exhibition on so large a scale would be needlessly bewildering and fatiguing to the public, and be an impediment to the studies of the scientific visitor. They, therefore, recommend a limited, though liberal, exhibition of the collections, on the principle of arrangement technically described as 'typical.' The expense of a building for this purpose covering 5½ acres, would probably amount to £567,000. With regard to the British and mediæval collections, the report states that the evidence received on the subject of their retention or removal has been most conflicting, both proposals having received the approbation of high authority. But, having considered the arguments on both sides, the Committee observe that the British Museum is a repository in which objects of historical or archæological interest ought to find a place without limitation to any particular time or country; that there is no more reason for keeping mediæval antiquities separate from those of Greece and Rome than for placing the latter apart from the remains of Egypt and Assyria; that if space were assigned, and a fair proportion of the public grant were allotted to it, the department of mediæval antiquities would soon become one of great interest to the public and of great value to the student of history, and probably be enriched by valuable bequests and gifts. With regard to the collection of antiquities the keeper of the department requires 61,469 additional superficial feet of floor space for exhibition, assuming that the ethnographical collection, which will require a space of 10,000 feet, will be retained in the Museum. The Committee have come to the conclusion that the total amount of space required for the various collections is 81,268 superficial feet, exclusive of the unascertained space required for the department of zoology, and for studies and working rooms. They state that the ground immediately surrounding the museum, within the adjacent streets on the east, west, and north sides, comprises altogether about 5½ acres, valued by Mr. Smirke at about £240,000, that as the proprietary interest in all this ground belongs to a single owner, it would be a convenient, and possibly even a profitable, arrangement for the State at once to purchase that interest, and to receive the rents of the lessees in return for the capital invested. The State would then have the power, whenever any further extension of the Museum became necessary, to obtain possession of such of the houses as might best suit the purpose in view, whereas if only a limited portion of the land required be now purchased, the price of what remains would probably be enhanced. The cost of the land and buildings required to carry out the plan for the removal of the natural history collections to Kensington, according to the estimate contained in the report of the Special Committee of Trustees, which was founded on the assumption that 5½ acres of land are necessary, would amount to £620,000. To this sum would have to be added the expense of a departmental library, of packing and removing the collections, and of the extensive fittings and cases required in the new Museum—expenses all forming part of the first cost of this plan, and independent of the additional annual charge for augmentations of the departmental library, and for the maintenance of the requisite staff both for that library and for the greatly enlarged public galleries of exhibition. If, however, the limited principle of exhibition for the natural history collection should be adopted, less land would be required, and the estimate for buildings might be greatly reduced. But neither of these arrangements would obviate the necessity of providing the additional space required for the department of antiquities at the British Museum. Under all these circumstances, and on a full consideration of the evidence adduced, the Committee have arrived at the conclusion that sufficient reason has not been assigned for the removal of any part of the valuable collections now in the Museum, except that of ethnography and the portraits and drawings, which might be removed to a building to be erected on the north side. With regard to the means by which the collections in the Museum may be made most available to the interest of science and art, it has been suggested that lectures should be delivered in connexion with the Museum; but the Committee are of opinion that, though it would be of the greatest advantage that the meaning of the various collections should be rendered as intelligible as possible to the public, they consider it questionable whether the conversion of the Museum into an educational institution would not be a departure from the principle on which it rests. The Committee look on the British Museum as primarily being a great consultative repertory, and have, therefore, come to a conclusion decidedly against the proposal for giving lectures in the Museum."

A NEW FORM OF ALKALIMETER.

At a meeting of the Liverpool Chemists' Association in May last, Mr. Weir exhibited and described a new form of self-acting alkalimeter. This instrument is represented in the annexed cut. It consists of an ordinary alkalimeter tube, properly graduated, to the mouth of which is fitted a kind of india-rubber stopper, furnished with two openings; through one of these passes the limb of an ordinary glass syphon turned up at each end. The other opening is connected with an ordinary india-rubber air ball, having a small hole by which the air can enter. By pressing upon the ball with the finger over the hole, the liquid may be forced into the syphon and made to drop out at any required rate; upon removing the finger the air enters by the hole in the elastic ball, and the syphon of course remains uncharged.



DO BAD SMELLS CAUSE DISEASE?

The tendency of the human mind to rest satisfied with any belief that is authoritatively asserted, is too well known to require any comment. Philosophers of all kinds are no more exempt than other people from this easy style of dealing with difficult problems. Medicine is, we think, especially chargeable with cherishing pet answers to questions that force themselves unkindly on her; and we think that the way in which she has made up her mind as to the cause of various kinds of fevers, is an example of this style of cutting the Gordian knot.

Of late years, it must have struck all our readers that pig-sties, dirty pools of water, open privies, ash heaps, &c., have been declared highly criminal, and on all occasions even adjudged guilty of producing any kind of fever or bowel complaint that may have broken out in the neighbourhood. If a child happen to suffer typhus in a farm-house, it is the mixen at the end of the barton that caused it. If an epidemic of English cholera befal a village, it is traced to the duck-pond by the road-side. If in a wealthy household the inmates are stricken with diphtheria, some open sewer, close at hand, has, as a matter of course, been the cause. So accustomed are we to hear this sort of reasoning resorted to on all occasions, that one feels a little difficulty in expressing doubts as to the certainty with which the effect is unhesitatingly traced to its cause. Nevertheless, we think there is at least sufficient evidence to cause reflecting minds to pause ere they give in their adhesion to the general opinion, and thus shut their eyes to further research and inquiry. Dr. Watson has, we know, stated it as his distinct opinion, "*that neither animal nor vegetable decomposition is sufficient to generate fever of any kind;*" and the researches of Dr. Guy and other observers have certainly gone some way to support that opinion.

Dr. Guy, in his very interesting contribution to the *Journal of the Statistical Society*, on the health of Nightmen, Scavengers, and Dustmen, gives us a mass of statistical fact which, it must be confessed, run counter to the generally received opinion, that foul animal or vegetable emanations are the fruitful source of disease. This class of men, without doubt, spend their days in the very midst of filth of all kinds. He says:

"In most of the lay-stalls or dustmen's yard, every species of refuse matter is collected and deposited—night-soil, the decomposing refuse of markets, the sweepings of narrow streets and courts, the sour smelling grains from breweries, the surface soil of the thoroughfares, and the ashes from the houses."

This heterogeneous mass the scavengers or "hill" people have to sort or to pass through sieves, so that the emanations arising therefrom must be brought into intimate relation with their lungs and skin. If fever and diarrhœa are so clearly traceable to the vicinity of these so-called noxious materials, surely the scavengers ought to be a poor fever-stricken race. A medical examination, however, of this class of workmen as compared with brickmakers and bricklayers' labourers, proves that the scavenger is comparatively exempt from disease. Thus, among a number of men examined in each of the three classes, it appeared that the numbers attacked by fever were, among the scavengers, 8 per cent.; among the bricklayers' labourers, 35.5 per cent.; and among brickmakers, 21.5 per cent.

This result seems extraordinary enough; but it may be argued that these men do not live in the lay-stalls or dust-yards, and therefore that their exemption from fever may be attributed to this; but what can be said if the master dustmen and their families who live all their lives in the midst of these heaps of so-called fever-nests, are healthy? Dr. Guy says:

"I do not think that, whether in town or country, such another body of men (as master dustmen) could be brought together except by selection; and it is not going too far to assert of them, that, if the comparisons were limited to the inhabitants of London, or our large towns, no score of selected tradesmen could be found to match the same number of scavengers brought casually together."

Unless we suppose that the scavengers get used to this so-called miasmatic atmosphere, or that after a time it no longer affects them, we cannot see how the foul emanation theory can hold water. Nature cannot work in one place differently from another. Night-soil must be just as deadly in an open yard in London as in the country. But here we have the experiment tried on a larger scale, of a whole

class of men subjected to foul emanations, and yet they are far from being an unhealthy race, and are not nearly so prone to fever or bowel disease as the bricklayers' labourers.

We are far from wishing to be understood, however, that we do not consider foul emanations as dangerous or baneful under any circumstances. In our opinion, they become noxious when much concentrated. Our houses, for instance, are built on the principle of a bell-glass; and our drains and privies, and all other impurities, if allowed to give off a deleterious miasma, most certainly do become most virulent sources of disease. But, in the open air, we think it very doubtful whether these emanations are ever the cause of injury to man.

Let us watch with Dr. McWilliam a still more gigantic experiment on the health of the Thames waterside people, which has been going on for years, and is still proceeding. The whole sewerage of two and a half millions of people has within the last ten years been turned into the metropolitan stream. Year by year its waters have become more contaminated, and its smell more disgusting. It should follow that the health of the waterside community is proportionally decreasing; that febrile complaints, cholera and diarrhœa, are alarmingly on the advance. But what is the real state of the case? Dr. McWilliam in his Report for the year 1858 on the health of the Water Guard and Waterside Officers of her Majesty's Customs, says:

"As respects bowel affections, to which I include diarrhœa, choleratic diarrhœa, dysentery, &c., the types of these forms of disease, which, in this country, noxious exhalations are commonly supposed to originate, we find the additions during the four hot months of the past year from this class of complaints 26.3 below the average of the corresponding period of the three previous years, and 73 less than those of 1857."

The quantity of putrescent animal and vegetable matter in the Thames has been going on increasing; but the illness generally attributed to the emanations arising therefrom has been decreasing! We know that many will urge that all the combustibles (if we may use the term) being thus accumulated, it only requires the match to be applied, to find epidemics raging like wildfire. But the year before last, cholera did break out on the banks of the Lea, and there died out, apparently from want of sustenance. This year, according to the *Lancet*, cholera, veritable Asiatic cholera, has been on board the Dreadnought; yet it has not spread, and there seems no likelihood of its doing so, for this season at least. As Dr. McWilliam truly says, "It is nowhere sustained by evidence that the stench from the river or docks, however noisome, was in any way productive of disease." It is true that one waterman, in June last, was said to have died of Asiatic cholera, and that his death was ascribed to river poison; but, as the eminent observer whom we have just quoted correctly remarks, "It is opposed to analogy, and to the usual order of nature, and therefore unphilosophical, to suppose that a cause so extensively diffused should have been so singularly limited in its effect."

Greatly doubting, as we do, the alleged ill effects of foul emanations in the open air upon human life, we nevertheless do not think that the crusade against filth should for one moment be relaxed. A bad smell may be no more unhealthy than a bad taste, but we should, if possible, avoid the one as much as the other. What we should, above all things avoid, however, is the falling into the error of supposing that bad smells are the indubitable sources of many puzzling diseases, and of thus hardening our minds against investigations of the kind which were instituted a year or two ago by Dr. Barker, and which, when completely carried out, will enable us to decide what the noxious principles are which make all the difference between an unpleasant and a malarious odour.—*British American Journal.*

MISCELLANEA.

Autumn on the Thames.—No gardens of ancient or modern times can compare with the Royal Botanic Gardens at Kew for the innumerable variety and number of foreign plants, rare and majestic native trees and exotic ferns, thriving in health and marvellous beauty within its ample domain. To the young artist and artificial florist desirous of making progress in their calling, the months of September and October offer a most favourable opportunity for the study of foliage in all its endless variety of form, size, and hue; the lover of nature, too, in one of her most

beautiful aspects, and the admirer of gorgeous colouring, may also, at this season of the year, enjoy a treat of the very highest order, as the old and new arboretums, the pinetum, and many of the conservatories are brilliant with a thousand exquisite tints, the whole forming a series of sylvan pictures, rich with excess of beauty, forcibly reminding visitors of the departing glories of ancient Sherwood and the grandeur and magnificence of American primeval forest scenery during the fall of the leaf, or Indian summer, of that vast continent. Standing on the western terrace of the great tropical Palm-house, gilded by the setting sunbeams of a fine autumnal cloudless sky, the matchless view, embracing the whole of the extensive amphitheatre, inclosing the new arboretum with its floral temples, groups of patriarchal elms, lofty pines, stately oaks, spreading cedars, woodland glades, and noble avenues, bounded by the calm, flowing river, which seen at high water from an eminence (Victoria Mount), has the appearance of an extensive serpentine lake —the stream, reflecting the bright azure of the lovely sky, realizes the idea of a splendid sheet of lapis lazuli, or an immense turquoise, enwreathed with emeralds, variegated with the most costly gems—is beautiful and picturesque almost beyond the power of language to depict; no written description can convey to the reader its enchanting loveliness and surpassing beauty; the prospect, from its magnitude, loneliness, and solitude, approaches sublimity—it must be seen to be enjoyed and appreciated. This glorious and perfect panorama is universally allowed by competent judges to be unrivalled as a specimen of English landscape gardening and river scenery throughout the world.—*Athenæum.*

Stramonium in Hydrophobia—The *Presse Médicale Belge* states, on the authority of Father Legrand de la Leray, one of the oldest missionaries in Tonquin and Cochin China, that in those countries hydrophobia is cured by boiling a handful of the leaves of *Datura Stramonium* in a litre of water, until reduced to one-half, and then administering the potion at one dose. A violent paroxysm of rage ensues, which lasts but a short time, and the patient is cured in the course of twenty-four hours. The great difficulty would appear to consist in administering the remedy to the patient.

Spontaneous Ignition of Lucifer Matches.—Two instances of the above have been lately reported, and it is supposed that the destruction of many ships at sea may be attributed to this cause. In one case the ship Fiel, loading for Havannah in St. George's Dock, Liverpool, was discovered to be on fire. It was traced to a case of lucifer matches that had been surreptitiously shipped on board. In the other instance a case, intended for one of the steamers loading at Fresh Wharf, London Bridge, was being carried down to the vessel, when it fell to the ground and instantly burst into flames.

Blistering Paper.—Take of Cantharidine, 3j.; White Wax, 3j.; Olive Oil, 3v. Melt together. With a brush paint it over some white bibulous paper, and hang up to dry in a current of air. Take a piece of pink paper form and size required, the under coloured side paint over with a weak solution of india-rubber; cut the cantharidine paper the form and size (less a margin) of the pink paper, and while the india-rubber solution is still sticky place it on, and when dry roll it up. It is unaffected by damp, and blisters with certainty. Before applying, the blister should be held over the steam of hot water.

Pharmacy in Lower Canada.—A member of the Canadian Parliament had introduced a Bill for "An Act to regulate the time during which Apothecaries and Druggists' shops shall be kept open in the different cities of Lower Canada." This wise legislator wishes to *compel* the apothecaries to keep open shops from 6 A.M. to 9 P.M. from April to November, and from 7 A.M. to 9 P.M. for the remainder of the year, with other analogous regulations applying especially to Sunday. As the *British American Journal* observes:—"We wonder that the author of the Bill has not gone a step further, and prescribed the particular dress with which the apothecaries should decorate their persons, and the hours during which they should take their meals." The apothecaries in Montreal have deliberated upon the subject, and at a meeting held on the 24th ult., John Carter, Esq., in the chair, the following resolution was unanimously adopted:—

"That having carefully considered the Act now before Parliament, entitled 'An Act to regulate the time during which Apothecaries and Druggists' shops should be kept open in the different cities of the Province,' this meeting regards the provisions of said Act as unjust, vexatious, and highly injurious to the interests of those connected with the said profession, and unnecessary for the public at large; that a petition be presented to the Parliament, praying that the Act now before the house, entitled 'Apothecaries' Bill,' do not pass; and that a copy of this resolution be forwarded to the members for the city of Montreal."—*American Journal of Pharmacy*, September, 1860.

An Act relating to Explosive Compounds.—An Act has been passed to amend the law concerning the making, keeping, and carriage of gunpowder and compositions of an explosive nature, and concerning the manufacture, sale, and use of fireworks. The object of this Act, which will take effect from tha 31st of August next, is to prevent a recurrence of the serious accidents which have happened by the explosion of gunpowder and fireworks. It contains numerous provisions for preventing accidents, and the regulations are to be enforced under penalties. "It shall be lawful for the Justices of the Peace for each county or other division at their general Quarter Session, or for the Council of any Borough upon application made to them by any person, from time to time, to license places for the making of loaded percussion-caps and for the making and keeping, respectively, of ammunition, fireworks, fulminating mercury, or other explosive preparations or compositions, and to determine the quantities of such articles, respectively, to be kept in any place so licensed, and to grant licenses to persons to sell fireworks." No person is to sell, offer, or expose any fireworks without a licence, or to any person apparently under 16 years of age, under a penalty of any sum not exceeding £5, and a like penalty is to be enforced for throwing any fireworks in or into any thoroughfare. Owners of mills, &c., may make rules for their servants and workmen.

Prevention of Accidental Poisoning.—In an article in the *Lancet* of Sept. 15th, on "Druggists no Poisoners," we find the following curious suggestion on the wholesale poisoning by arsenic at Bradford, Dec. 1858:—"Query—If the cask containing the arsenic had been distinguished from that containing *daff* by some such contrivance as making it impossible to take off the lid or move it without causing a bell (fixed somewhere on the cask) to strike, might not the young man have been warned by it, and the *twenty-five deaths* been so prevented?"

Sale of Poisons in France.—A medical student, named Delorme, and a retired apothecary, named Boucaumont, have been tried before the French Tribunal of Commerce on the charge of homicide by imprudence. The following were the circumstances of the case:—A young girl, eighteen years of age, went astray, but after a while was seized with remorse, and determined to commit suicide. A friend remonstrated, and, as he thought, succeeded in persuading her to abandon the intention. A few days afterwards she called on Delorme, and in the course of conversation took up a phial containing an arsenical compound. "Do not touch that," he said, "it is poison." "I am not afraid of poison," she replied; and from what afterwards transpired, she appears to have secreted the phial, and went away. Two days later she committed suicide by means of this poison. The phial having been traced to Delorme, he was arrested and tried for his imprudence in allowing the girl to obtain the poison, and Boucaumont for supplying the poison, contrary to the regulations in force. The defence of the former was, that he did not know that the girl had taken the phial, and of the latter, that it was supplied with the understanding that it was required for experiments. The tribunal condemned each to three months' imprisonment, with the addition of a fine of 50f. in the case of the apothecary.

Poisonous Fungi.—An inquest has been held at the Cricketers' Hotel, Ipswich, on Thomas Boothroyd, aged 17, and Adelaide Boothroyd, aged 14. Thomas gathered what he considered mushrooms in Stoke Park, which were cooked and partaken of by the deceased and family. Sickness followed shortly after, and death took place. A cat which had also eaten of the mushrooms died from the effects.—The jury returned a verdict that death was caused by eating poisonous mushrooms. The jury also added, "That great caution should be exercised by persons eating mushrooms, inasmuch as that there does not appear to be any satisfactory rules for distinguish-

ing those mushrooms which are wholesome from those which are poisonous. And that in some persons even the edible mushrooms will produce disorder of the stomach and bowels by the effects of idiosyncrasy."

An Accidental Dose of Laudanum.—During a recent tour of the vicar of the parish of Clare, in Suffolk, he stayed for a short period in a Welsh town, and not feeling very well he applied to a chemist for a dose of tincture of rhubarb. The chemist, misunderstanding him, gave him tincture of opium, which he took home and drank, but immediately afterwards discovered his mistake on looking at the bottle, which had the proper label upon it. Medical assistance was immediately obtained, and the usual remedies applied, which eventually proved successful.

Accidental Poisoning by Arsenic.—Three men in the employ of Messrs. Crum and Thernliebank, of Glasgow, boiled some potatoes in a dish used for the purpose of lifting a liquor employed in some process of bleaching. The three men having eaten heartily of the potatoes, were seized with violent pain and vomiting, but ultimately recovered. It appeared that the liquor for which the dish had been used, contained a large quantity of arsenic and chlorate of potash, with which the potatoes had become impregnated.

Death from Chloroform.—A patient named Carrell, aged 42, died at the Northampton Infirmary, on Wednesday, Sept. 5th, from the administration of chloroform. Deceased went to the Infirmary on Saturday, Sept. 1st, with the determination of having a tumour taken out of his back, which had caused him some little annoyance for several years. He was dieted until Wednesday morning, and then taken to the operating room for the purpose of having the tumour extracted. Dr. Gray and Dr. Mash were present, to whom deceased expressed a wish that chloroform might be administered before the operation commenced. Dr. Mash did not think it necessary to use chloroform, but deceased still persisted in his wish. Dr. Mash therefore consulted Dr. Ashdown, and requested that gentleman to examine the deceased to ascertain if he was able to bear the effects of chloroform. Dr. Ashdown said there was no danger, and accordingly the house doctor, Mr. Grey, was instructed to administer the anæsthetic, which he did, the chloroform being given on a handkerchief. Its effects were soon visible upon deceased, who duly became insensible without anything unusual being observed, although he was closely watched. On removing him into a proper position for performing the operation it was observed that his countenance was very much changed. The suspicions of the operators were at once roused, and immediate steps were adopted for bringing the man to his senses again, instead of commencing their surgical operation. Water and other restoratives were resorted to, but all to no purpose. Artificial breathing was then tried, but this, too, was unavailing, and, after an hour's futile endeavours at restoration, the deceased was reluctantly given up as lost. An inquest on the body was held at the Infirmary on Thursday, before Mr. E. P. Hicks, county coroner (acting for Mr. J. Becke). From the evidence adduced, it appears that the tumour was first perceived about nine years ago, and was supposed to have originated through a blow inflicted by a policeman at Liverpool, when deceased was under the influence of drink. He had only been in Northampton since March last. Drs. Gray, Mash, and Ashdown were also examined, all of whom stated that they had known patients to inhale double the quantity of chloroform that had been administered to deceased without any dangerous effects resulting from its use. Every precaution had been used by them in this as in former cases, and it had been administered to hundreds with perfect success. They could not account for this unusual occurrence, but had no hesitation in saying that deceased had died through the effects of chloroform. A *post-mortem* examination had been made by Drs. Mash and Gray, in presence of the medical staff, and it appeared that deceased had been a man given to drinking habits. His brain, heart, and lungs were very much congested. The jury, without any consultation, returned a verdict, "That deceased's death was caused by chloroform duly administered. They also begged to state that in their opinion the surgeons were entirely free from blame in the matter, as it appeared to them that the proper caution had been taken when administering the chloroform."

Suicide by Vermin Powder.—Ann Collins, aged 20, a domestic servant at Cheltenham, committed suicide by taking "Board's Vermin Powder." Death took place in about an hour and a quarter after swallowing the poison. An inquest was

held, when Mr. John Horsley, analytical Chemist, stated that he had analyzed a portion of the contents of the glass, and of one of the powders, with the expectation of finding strychnia. He also analyzed a portion of the viscera of the deceased. Mr. Horsley was about to describe the details of the processes by which he had obtained a very minute quantity of strychnia, but the jury thought it unnecessary, as all they had to decide was whether deceased died from poison.

Suspected Case of Poisoning.—At Willenhall, in South Staffordshire, a man, named William King, was arrested on a charge of poisoning his wife. It appeared that the man had given his wife money to spend in ale, and subsequently had given her some rum out of a bottle he had in his possession, and at about a quarter to twelve the same night she became ill, and suffered violent pain from cramp in the legs. A surgeon was sent for, and Mr. Taylor prescribed an emetic and also medicine, but the serious symptoms continued, and the woman died at about a quarter to six o'clock on Thursday, Sept. 13. An inquest was opened on the body, and witnesses deposed to the deceased's statement as to the conduct of her husband. The coroner adjourned the inquest.

At the adjourned inquest, Mr. Hartill, surgeon, who made the *post-mortem* examination, deposed to the condition of the body. The upper opening of the stomach was highly inflamed, and at the base of the skull there was about an ounce and a half of liquid blood. The stomach and its contents were analyzed by Dr. Alfred Hill, of Birmingham, who deposed that he found slight traces of antimony, but not sufficient to account for death. The stomach smelt strongly of spirits, and he was of opinion that death was occasioned by drunkenness. The jury desired that the portion of the stomach, &c., that remained unexamined should be analyzed, and that another analyst should be called in. The inquest was again adjourned.

BOOKS RECEIVED.

An Introduction to Practical Pharmacy; *Designed as a Text-Book for the Student, and as a Guide for the Physician and the Pharmaceutist, with many Formulæ and Prescriptions.* By Edward Parrish. Second Edition, greatly enlarged and improved. With 246 Illustrations. Philadelphia: Blanchard and Lea. 8vo, pp. 720. 1859. (From the Author.)

Ure's Dictionary of Arts, Manufactures, and Mines. New Edition, chiefly re-written, and greatly enlarged. Edited by Robert Hunt, F.R.S., &c. &c. Illustrated with nearly 2000 Engravings on Wood. London: Longman, Green, Longman, and Roberts. 1860. (Part xii.) (From the Publishers.)

TO CORRESPONDENTS.

The British Pharmacopœia.—*A Correspondent* (Maidstone) states, that as new formulæ will most probably be introduced in the forthcoming Pharmacopœia, it will be very important for the dispenser to have an accurate knowledge of the doses of such preparations; he therefore suggests that a posological table should be inserted.

X. Y. Z. (Doncaster).—In the decomposition referred to, the caseine of the milk forms, with the oxide of lead, an insoluble compound.

A Reader (Leeds).—*Indian Baël.*—Vol. x., page 165. We know of no formula for Tincture of Indian Baël.

M. P. S. (Leominster).—*Pulv. Bismuthi Comp.* Vol. i. (2nd Series), page 296.

T. W. (Atherton) is thanked for the specimen.

J. P. (Chard).—The Classical Examination includes the simple rules of arithmetic.

Notice.—We beg to inform several Correspondents that, in consequence of the re-building of the premises in Bloomsbury Square, the delivery of the back numbers of the *Pharmaceutical Journal* has been delayed, but they will be forwarded in the course of next month. The answers to several correspondents are also delayed until next month.

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, Elias Bremridge, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. Churchill, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.
SECOND SERIES.

VOL. II.—No. V.—NOVEMBER 1st, 1860.

RESPONSIBILITIES OF THE DRUG TRADE.

It is not merely in the sale of poisons, or the dispensing and retailing of medicines, that the Druggist is made sensible of the responsibility of his position; the Drug Merchant as well as the Pharmaceutist has his responsibilities, and is expected to possess such a knowledge of the substances with which he deals as shall enable him to protect the public from serious danger.

An account will be found in another part of this journal of a case tried before the Lord Mayor of London, in which a Drug Merchant was fined for shipping sweet spirit of nitre without specifying the danger which may attend the incautious stowage of it in a ship's hold.

It appears that an order was given to a wholesale Druggist for a number of medicines, including sweet spirit of nitre and compound spirit of ether, to be shipped to Singapore. The order was duly executed, and the goods, packed with straw in a wooden case, were sent for shipment by the Pera, one of the Peninsular and Oriental Steam Navigation Company's vessels. The case was marked "Glass," and described as "Apothecary Wares." It contained a gallon of sweet spirit of nitre contained in a strong well-stoppered stone bottle capable of holding about a gallon and a half, so that there was ample room for expansion of the liquid. Immediately after the package was put on board, it was suspected from the odour emitted that some leakage had taken place, and on further examination it was found that the bottle containing the sweet spirit of nitre was cracked. Upon this discovery being made the goods were immediately unshipped, and proceedings were taken against the shipper under the Merchant Shipping Act of 1854, which enacts that "No person shall be entitled to carry in any ships, or to require the master or owner of any ship to carry therein, any aquafortis, or oil of vitriol, gunpowder, or any other goods which, in the judgment of such master or owner, are of a dangerous nature; and if any person carries or sends by any ship any goods of a dangerous nature, without distinctly marking their nature on the outside of the package containing the same, or otherwise giving notice in writing to the master or owner at or before the time of carrying or sending the same to be shipped, he shall for every such offence incur a penalty of not exceeding £100, and the master or owner of any ship may refuse to take on board any parcel that he suspects to contain goods of a dangerous nature, and may require them to be opened to ascertain the fact."

The question to be decided was, whether sweet spirit of nitre and compound spirit of ether were goods of a dangerous nature, such as were contemplated by the act. The evidence of Dr. Letheby, the officer of Health for the City of London, was to the effect that sweet spirit of nitre "is a mixture of one part of a very volatile ether, called *hyponitrous ether*, and four parts of spirits of wine;" that "it mixes with water, but has a tendency to float unless agitated;" that "it is volatile at ordinary temperatures;" that "it begins to boil at 130°, and gradually rises to 170°;" that "there would be two effects from the leakage of a vapour so compounded mixing with the atmosphere: first, the injurious effect to those inhaling it, for, like chloroform, it is a powerful agent in producing insensibility, and it will take fire at a point several yards away from the surface of the liquid, which," the witness said, "I can prove by an experiment." (The witness then put into a dry quart bottle in court about twenty drops of the spirit of nitre, and in a few minutes the vapour diffused itself throughout the

atmosphere of the bottle. He then applied a light to the mouth of the bottle, when a sheet of flame passed to the bottom of the bottle with a slight explosion.) Evidence was given on the other side to show that the goods were packed in the same way as they usually are for shipment under similar circumstances, and that sweet spirit of nitre was not considered so dangerous as had been represented by Dr. Letheby; but the statements, and especially the experiment, of the City Officer of Health, were considered sufficient to establish the case against the merchant, and he was accordingly fined £10.

Some dissatisfaction having been expressed with this decision, we are induced to make a few remarks upon it. Dr. Letheby has undoubtedly made an exaggerated representation of the dangerous nature of sweet spirit of nitre. This popular medicine, as made according to the London Pharmacopœia, and used in this country, does not contain one-fifth part, or twenty per cent., of hyponitrous ether. The proportion (which differs according to the mode of conducting the process) varies from two per cent. to about five or six per cent. of the ether. The ether does not separate from the spirit on the addition of water, nor does it commence boiling at a temperature of 130° F. The article referred to by Dr. Letheby, possessing these characters, was not, therefore, the article in question. If Dr. Letheby's sweet spirit of nitre is as dangerous as he has described it, it does not follow that ordinary commercial sweet spirit of nitre should be so, and it is very certain that it is not.

It must be admitted, however, that sweet spirit of nitre is, or ought to be, in all cases a solution of hyponitrous ether in spirit of wine, that the ether is very volatile at common temperatures, and that both constituents are not only volatile but highly inflammable. Due care ought, undoubtedly, to be exercised in reference to the shipment of this article, and perhaps a little exaggeration of the danger which would attend its leakage in the hold of a vessel may be excusable on account of the tendency there is to overlook or inadequately appreciate danger in such cases, by those who are daily engaged in handling and otherwise dealing with the article under circumstances which do not involve the same danger. Instances have occurred in which accidents such as were referred to by Dr. Letheby, have occurred from want of due caution in dealing with sweet spirit of nitre. Some years ago the premises of a wholesale Druggist, in the City of London, were burnt down in consequence of the vapour (as it was thought) of sweet spirit of nitre having ignited while the liquid was being poured from a carboy near to a lighted candle. In another case, a Druggist's Assistant, who slept in a small room partly used as a store-room, and in which some sweet spirit of nitre escaped from a cracked gallon bottle during the night, was found dead in his bed in the morning, death having been caused by suffocation. It is evident, therefore, that great care ought to be taken in the stowage and use of this liquid where large quantities of it are kept in confined places. But we think, nevertheless, that it was unnecessary to represent the danger so strongly as was done by Dr. Letheby. The effect of his representation was to call forth a leading article in the *Times*, in which the editor, after repeating, and assuming as strictly correct, the statements made by Dr. Letheby, proceeds to comment upon "those most frightful risks," which it may be inferred, he says, "are of no uncommon occurrence, and that many a steamer starts on her voyage with the elements of destruction below her decks." . . . . "It is shocking to think of the danger thus gratuitously added to the ordinary perils of the deep. In the jar shipped on board the Pera was a whole gallon of the nitre spirit. This quantity of the compound would have produced, according to Dr. Letheby's estimate, 4000 gallons of vapour, which, by its chemical combination with the atmosphere, would have formed 2000 cubic feet of a powerful explosive mixture. Why, there must have been force enough to blow into the air all our five steam rams at once. No iron-cased frigate could have withstood such a power."

We presume, then, that in future sweet spirit of nitre, instead of following after aquafortis and oil of vitriol, will be placed before gunpowder, in the category of dangerous substances. It is a question whether it will be allowed to be exported at all—certainly not by the Peninsular and Oriental Steam Navigation Company's vessels. Indeed, if it be so dangerous a substance, are Druggists justified in keeping not gallon bottles alone, but whole carboys of it in their premises? Cautious housekeepers, even, must expel the nitre bottle from the medicine-closet.

It is much to be regretted that so exaggerated a representation should have been made in this case of the dangerous nature of sweet spirit of nitre. Such statements usually defeat their object by ultimately, if not immediately, producing a reaction, and instead of leading to the adoption of judicious precautions, cause one class of the public unnecessarily to alarm themselves where no real danger exists, and another class to repudiate the statements as mere fallacies, and to reject such precautionary measures as the circumstances of the case really demand.

A DRUGGIST'S SUNDRY THOUGHTS.

BY MR. JOSEPH INCE.

No slight amount of domestic wretchedness occurs in Pharmacy from two simple causes:—first, the small capital required induces many to commence business at a very early age, on an unproductive, because on too limited a scale: of nothing, nothing comes. Secondly, this fatal facility is not in England placed under the safeguard of a compulsory qualification. These twin temptations lure the young Chemist into a life mistake; he embarks on Pharmacy without *any definite* conviction that it is a trade-science, essentially so constituted, that its trade dwindles into a poor subsistence when separated from its science, no less than its science languishes when unsupported by its trade. The two must stand together, and it is manifestly a want of prudence as well as a complete misunderstanding of the actual character of Pharmacy, to cultivate one and to neglect the other; to attach an undue importance to science in the abstract to the neglect of trade; or to concentrate the whole mental faculties on the development of trade, and to treat science as an interloper. If a man feel within him an innate love for the investigation of the laws of nature, and of that long train of facts which illustrate those laws; if he be conscious of an all-mastering impulse for the acquirement of knowledge for its own sake; if in his composition dwells no utilitarian principle, but his whole soul be absorbed in the grand old question "What is truth?"—for his own sake as well as for that of others, don't let him keep a shop. Such a being is not fitted for the wear and tear of business occupation: the experiment has been tried, but it has never prospered; and, though it may seem a prosaic sentiment, yet honesty compels me to confess that too much science, like too little knowledge, is a dangerous thing; daily experience demonstrates that these highly refined intelligences, with cultivated tastes and lofty aspirations, are not found succeeding in the commercial and unromantic world in which we live.

On the other hand, it is a blunder entailing painful consequences, to select Pharmacy as a vocation, and limit it to a mere trade; to earn a laborious and precarious living solely from its accessories and accidental aids, without the smallest reference to that applied science which is, or should be, its motive power. I am satisfied that there is a danger at the present time of falling into this commercial error, and that the young Pharmaceutist does so in the purest ignorance. Amidst all our various expedients, let it never be forgotten that the one main point towards which our energies should be directed as Pharmaceutists, is beyond question Pharmacy. Let a new establishment be ever so small geometrically,

and let the master attain a well-grounded reputation as a Pharmaceutist, whatever be the difficulties that beset his pathway, he must ultimately struggle through; and, I have no fear in stating, that whether in the crowded streets of London, where competition is in its keenest and highest phase, or in the comparative quiet of a country town, Pharmacy courageously enthroned as the grand point of excellence, to which all others are to be made subservient, will never fail. Unhappily, the truth of this statement is not acknowledged by a vast number of hard-working, conscientious men. I should be sorry to cast even a shadow of censure on the selection of those multitudinous helps to gain a livelihood which our modern Chemists so affect, knowing that in these railroad days it is no easy matter to conjure the day's returns into an equivalent to the day's expenses; but I am satisfied that this extreme hankering after what is secondary and adventitious to the almost utter exclusion of the first essential element in Pharmacy, namely, Pharmacy, often entails disastrous consequences.

I tremble when I see this obsequious worship of Druggists' sundries, because I know it is but the sign of an inward weakness which need have no existence. Hold fast by the true characteristics of the profession of your choice—let the world find that your preparations can vie even with those of historic houses; that they can ask for chemicals and not be disappointed; that they need go nowhere else to obtain that long catalogue of remedies which turn the scale for life or death; that in your hands may be safely trusted the suffering father, the wife lingering in weary agony, or the infant gasping for its breath; and having thus won for yourself an honourable name, these other little side-winds, useful and excellent in their place, will help you more easily to sustain it.

Would that I could coin words to bring this one thought home. The blight that withers so much toil; the leak that sinks so many a vessel; the malign genius that enters the new Pharmacy, keeps it poor, lengthens out its hours, clogs its work, rendering it hard, thankless, and unprofitable, is the owner's self-destructive ignorance that he is dealing with a trade-science, and his regarding the latter characteristic as a fit study for the bookworm, but an object of minor consideration to the rational man of business. Be it so—then he would have found himself an infinitely more prosperous and a happier man had he selected any other career than that of Pharmacy. He is playing Hamlet, and leaving out the Prince of Denmark; he is trying, like the Children of Israel, to make bricks without straw.

I am not disposed to bate one inch of vantage ground because some have pushed the trade principle unaided to ultimate success. I have personal friends who, perceiving that their instincts led them more to commerce than to Pharmacy, gradually cultivated some speciality which at first attracted their attention, and then absorbed it altogether, until in due course they branched out into manufacturing speculations, and abandoned Pharmacy. These gentlemen are no longer of us or with us; they have wisely followed out their individual inclinations, and I breathe no syllable against trade as such; but I deplore exceedingly that strange mental tortion that, having accepted Pharmacy as a subsistence, surrenders its entire faculties to the development of one side, and that the weakest of its constitution.

That struggling little corner shop, choked with Druggists' sundries, should not lament so bitterly to what a low-water mark poor Pharmacy has ebbed. Why should the Pharmaceutist blame the fountains for not rising higher when he has stopped the hydraulic power?

31, *Southampton Street, Covent Garden.*

(*To be Continued.*)

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, *5th September*, 1860,

Present—Messrs. Bottle, Brady, Bucklee, Evans, Hanbury, Haselden, Herring, Lescher, Morson, and Squire, the following were elected

MEMBERS.

HEREFORD .....Crowe, Thomas Lea
LONDON .....Long, Henry
" .....Tilburn, Robert James
MELBOURNE .....Parker, Charles
NOTTINGHAM.....Burton, John

MEETING OF THE COUNCIL, *3rd October*, 1860.

Present—Messrs. Bottle, Bucklee, Deane, Evans, Hanbury, Herring, Hills, Lescher, Macfarlan, Meggeson, Morson, Sandford, Squire, Standring, and Waugh.

MAJOR EXAMINATION, *16th October.*

Watton, Edward .....Manchester

MINOR EXAMINATION.

Churchyard, Robert L.....Bungay
Coles, John William.....Camberwell
Gregory, George Henry ....Crediton

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS.
Dalrymple, David H.	Mr. Chapman	Bristol
Epps, Franklin.....	Mr. Epps	London
Fowler, Stanley	Mr. Bottle.....	Dover
Haddock, George John ...	Mr. Thompson	Norwich
Jones, Walter William	Mr. Jones	Brecon
Preston, Joseph Classon...	Messrs. Preston	London
Roberts, Thomas E.....	Mr. Jones	Rhyl
Squire, Frank Robert	Mr. Asling.....	Spalding
Williams, Robert H.	Mr. Jones	Rhyl
Wilson, William.....	Mr. Griffith	Slough

EXAMINATION IN EDINBURGH, *October.*

MAJOR

Smith, James Taylor .. ..Kilmarnock

REGISTERED APPRENTICE.

NAME.	RESIDING WITH.	ADDRESS.
Beattie, John	Mr. Mackay	Edinburgh

PHARMACEUTICAL MEETING.

Wednesday, October 3rd, 1860.

MR. T. N. R. MORSON, PRESIDENT, IN THE CHAIR.

THE following

DONATIONS TO THE LIBRARY AND MUSEUM

were announced:—

Historical Notices of Enfield. By J. Taff. From the Author.
Illustrations of the Nueva Quinologia of Pavon. By J. E. Howard. From the Author.

Journal of the Chemical Society. From the Society.
Journal of the Society of Arts. From the Society.
The Photographic Journal. From the Photographic Society.
Transactions of the Linnean Society. From the Society.
British Journal of Dental Science. From the Publisher.
Proceedings of the Manchester Philosophical Society. From the Society.
The Chemist and Druggist. From the Editor.
The Chemical News. From the Editor.
A Specimen of Oil of Tonquin Beans, and a Specimen of Coumarin. From Mr. T. B. Groves.
A Specimen of East Indian Rhubarb. From Mr. J. S. Lescher.
A Specimen of Pareira Brava Root. From Mr. H. Deane.

DISTRIBUTION OF PRIZES.

The Chairman stated that the principal business of the meeting would consist in presenting to the successful competitors the prizes and certificates of merit which had been awarded to students at the conclusion of the previous session of the School of Pharmacy. It had been expected that the meeting for this purpose would be held in the new lecture-hall, but in this respect they were disappointed, and he regretted, in common with the other Members of Council, that they were not able to afford better accommodation to their visitors, and to the Members and Associates who attended. He begged to call on the Professors to report the results of the examinations in their respective classes.

CHEMISTRY AND PHARMACY.

Professor Redwood said it would be satisfactory to the meeting to hear that the last session of the School had been one of the best they had had in regard to the numbers who attended and the diligence and general progress of the students. Having been engaged as a teacher in the School from its first establishment, he could speak to the marked improvement which had occurred within the last two or three years as compared with any previous period. He did not mean to say that there had never been a larger attendance at the lectures than that of last year, for at the commencement of the Society's operations, when Pereira, Thomson, and Fownes were included among the Professors, the lecture-room had been well filled, the annual entries to each course being between seventy and eighty, but at that time a considerable portion of the classes consisted of Members of the Society, whereas now they consisted almost exclusively of young men who came to the School to follow up their apprenticeships with a course of systematic instruction which should fit them for the examinations required for admission into the Society. Throughout the last session the attendance had been numerous and very regular. The conduct of the students had been unexceptionable, and the proficiency manifested by those who had taken part in the examination for the prize and certificates of merit which the Council offered at the conclusion of the course, was highly creditable. The student, Mr. Frank Hooper, who had obtained the prize, had abundantly earned it. He had been a laboratory as well as a lecture pupil throughout the whole session, and his zeal and industry had never flagged from the commencement to the end of the time. So good were the answers he had given to the examination questions, that they might have been printed with scarcely a correction. He deservedly stood at the head of the list, but had he not been there to take the first place, there were others among the competitors to whom he would have gladly awarded the prize. The questions and the awards were as follows :—

1. How many grains are contained in the troy pound and the avoirdupois pound? What is the value in grains of the French gramme? What is the weight in grains of a pint of distilled water?
2. A substance lighter than water (x), weighed in air, weighs 79.05 grains, attached to a piece of metal, and the two suspended from one end of a balance and immersed in distilled water at 60° F., they weigh 279.3 grains; the metal alone weighed in a similar manner, while immersed in water, weighs 283.5 grains. What is the specific gravity of the substance (x)?
3. Describe what is meant by the terms specific heat and latent heat. How is the specific heat of a body determined? What are the specific heats of water, olive oil, and mercury? What is the latent heat of water, and how is it determined?
4. Describe cyanogen, its preparation, composition, characters, and properties.
5. Describe the process of the London Pharmacopœia for the preparation of *Acidum Hydrocyanicum Dilutum*, giving the decomposition, the strength of the acid produced, and the means of determining its strength, and of testing it with regard to its purity.
6. How are tannic acid and gallic acid produced from nutgalls, and what are the relations supposed to exist between these two acids?
7. Give the formulæ representing the composition of the following substances:—Pyroxylic spirit, alcohol, ether, hydride of benzoyl, benzoic acid, lactic acid, butyric acid.

PRIZE—BRONZE COUNCIL MEDAL...Mr. Frank Hooper.

CERTIFICATES OF MERIT .....
- Mr. Edward Powers.
- Mr. Edward Morell Holmes.
- Mr. Frederick Baden Benger.
- Mr. Thomas Howard Hall.

BOTANY AND MATERIA MEDICA.

Professor BENTLEY said that he had again to report most favourably of the conduct, diligence, and progress of the students of his class during the last session. He was also pleased to add that the number of pupils in attendance was higher than any previous year. The competition for the prizes was a very severe one, and the Council had marked by honorary distinctions four of the competitors. In the *viva voce* examination two gentlemen had obtained the full number of marks which had been assigned to it; a circumstance, which Prof. Bentley said, had never before occurred. He was especially glad to be able to make public this fact, for, whatever difference of opinion there might be among Pharmaceutical Chemists as to the necessity of a knowledge of the higher branches of botanical science, there could be none as to the importance of a practical acquaintance with medicinal plants. The two competitors who thus distinguished themselves at the practical examination, and who were placed equal, were also equal at the written examination, and the Council, to mark their approbation of the highly satisfactory manner with which they had acquitted themselves, had awarded to each a Bronze Medal, instead of only giving one medal as on previous occasions. With regard to the two competitors who had gained Certificates of Merit, he could also speak most favourably, for he should have had no hesitation in recommending to the Council the award of the highest distinction to either of them, had no other competitors been above them in merit, so highly did he estimate the character of their answers. The two competitors, also, who had gained Certificates of Merit were both first year's pupils, and he trusted that on a future occasion there would be prizes offered by the Council both for first year's men, and to those who were more advanced in their studies.

The questions for the written examination were as follows:—

1. Describe annular, reticulated, scalariform, and spiral vessels.
2. Describe generally the internal structure and external appearance of a Monocotyledonous stem.
3. Define the terms hypogynous, perigynous, epigynous, epipetalous, didynamous, tetradynamous, gynandrous, syngenesious, adherent as applied to the ovary, and diadelphous.
4. Describe the characters of Russian, East Indian, Dutch-trimmed, and English rhubarbs.
5. Enumerate the officinal plants of the order *Compositæ*. Describe the botanical characters of Chamomile flowers, and state how they may be distinguished from those of *Matricaria Chamomilla* and *Matricaria Parthenium*.
6. What is the botanical source of Elaterium? Describe the process by which it is obtained, its physical and chemical characters in a pure state, and the means by which the substances commonly used for adulterating it may be detected?
7. Give the essential characters of the following natural orders, and enumerate the officinal plants which they respectively contain:—*Papaveraceæ*, *Cruciferæ*, *Rosaceæ*, *Umbelliferæ*, *Gentianaceæ*, *Convolvulaceæ*, *Euphorbiaceæ*, *Dioscoreaceæ*, *Iridaceæ*, and *Melanthaceæ*.

VIVA VOCE EXAMINATION.

Besides the above questions, the following plants were submitted to the competitors, who were asked to give their names, to state the natural orders to which they respectively belonged, to mention their medical and economic properties, and to describe any peculiarity they might present:—

Clematis erecta—Delphinium consolida—Aconitum Napellus—Sinapis nigra—Sinapis alba—Potentilla erecta—Epilobium angustifolium—Astrantia major—Lupinus species—Conium maculatum—Æthusa Cynapium—Coriandrum sativum—Asperula longifolia—Scabiosa species—Centaurea species—Valeriana officinalis—Ligustrum vulgare—Digitalis purpurea—Symphytum officinale—Solanum Dulcamara, var. alba—Lysimachia Nummularia—Euphorbia species—Ricinus communis—Aristolochia Clematitis—Polygonum erectum—Veratrum nigrum—Crinum species.

The medals and certificates were awarded as follows:—

EQUAL: BRONZE MEDALS..... { Thomas Howard Hall. / Frank Hooper.
FIRST CERTIFICATE OF MERIT .....Alexander Waugh.
SECOND CERTIFICATE OF MERIT ...Edward Morell Holmes.

The PRESIDENT, after presenting the prizes and Certificates to their respective owners, said the remainder of the evening would be devoted to the inspection of the new laboratory, which had just been opened, and which many of the Members were anxious to see. He was sorry the other parts of the Institution were not in a more advanced state, but those who had had any experience in building operations would not be surprised to find that the work was not finished by the time specified. Latterly, their efforts had been concentrated upon the completion of the laboratory, which, he was happy to say, was sufficiently advanced to afford the required accommodation for the pupils; and certainly a more extensive, commodious, and in every way well arranged suit of laboratories for the purposes of instruction, he had not seen. He had visited many similar establishments abroad, but knew of none superior, if indeed there were any equal, to that which was now provided for the Pharmaceutical Students of this country.

Mr. WAUGH was glad to hear so favourable an opinion of the new laboratories expressed by one who, having seen many of those abroad, was well able to form a correct judgment. He had no doubt they would all be satisfied and pleased with the result of the extensive alterations in progress. The labora-

tories were, certainly, very complete, and in every way more than realized the expectations which had been formed. They were much indebted to the Professor for the way in which he had carried out these alterations; and he doubted whether they could have found any one else who could have equally well provided for all the wants of the Institution. They were about to adjourn the meeting to their spacious laboratories, and he hoped in doing so that they would not be unmindful of the departed benefactor of the Society whose zeal in the cause of Pharmaceutical education, and whose munificent bequest for carrying out that object, had enabled the Council to provide means of instruction of which those who had long passed the years of pupilage had, in their time, no opportunity of availing themselves.

PROVINCIAL TRANSACTIONS.

LIVERPOOL CHEMISTS' ASSOCIATION.

THE ANNUAL MEETING

Was held at the Royal Institution, on Friday Evening, the 28th September, 1860,

DR. EDWARDS IN THE CHAIR.

The CHAIRMAN having congratulated the Members upon the success of the Association during the past session, and the excellent prospects of the coming one, called on the SECRETARY to read the

REPORT.

The termination of the eleventh year of the Chemists' Association again imposes upon your Council the pleasing duty of reporting to the Members the financial and numerical position of the Society, and also its proceedings during the past year.

Since the last report was presented, your Council are happy to inform you that there has been a considerable accession to the Society, 26 new Members and 10 Associates having been added to the list, against 17 resigned; the numbers on the roll being at present 156 Members and 21 Associates.

During the Session two special and eighteen ordinary meetings have been held, and the attendance has been fully an average one, as compared with former years; and your Council would take the liberty of suggesting to the Members generally, the desirability of giving every facility to the Associates and others in their employ for attending these meetings, being convinced that practical benefit would be the result.

The satisfaction and success which attended the Conversazione will form an inducement to your Council to provide future entertainments of a similar character.

Your Council are happy to state that they have received a very gratifying report from your Librarian, Mr. Walker, wherein he states that, during the year, 52 vols. have been added to the Library; 13 by presentation and 39 by purchase, making the total number of books at the present time 397, exclusive of a considerable number of papers, pamphlets, and unbound periodicals. Mr. Walker has also furnished some statistics relative to the progress and use of the Library during the last six years, as follows:—

	FOR THE YEAR					
	1854-5.	1855-6.	1856-7.	1857-8.	1858-9.	1859-60.
No. of Vols. in Library	77	167	230	324	345	397
No. of Members using the Library	34	32	50	77	72	90
Circulation of Books .	202	217	393	577	738	766
Amount of fines	15*s.* 8*d.*	£1 14 0	£2 2 6	£2 6 10	£2 14 2	£3 4 2
No. of Members and Associates	73	100	143	164	167	177

From this return it will be observed that the Library is rapidly increasing in value, and also that the number of Members using the books and the circulation of the volumes is greater than in any former year; the fines also, it may be remarked, contributing to the general prosperity; and keeping the success of past years in view, your Council will continue to make such additions as may be desired by the Members, so far as the funds will permit, and with the new works which your Council contemplate purchasing during the coming year, they consider that the use of the Library will be an increasingly valued privilege both to Members and Associates.

The Laboratory Classes have been well supported during the past Session, and the same feature has been observed in the character of the attendance which was previously noticed with great satisfaction—viz., that students who have attended one course, are, for the most part, anxious to continue their studies, and the improvement observed in the course of two or three years in those who have thus persevered, has been most marked and satisfactory; the majority also wisely devote two evenings in the week to the Class. During the Session 13 Students attended, and of these 7 had attended a former Session. This condition produced some inequality in the competition for the customary prize, which your President met by offering two handsome prizes, one of which was awarded to Mr. Job Preston, a senior, and the other to Mr. J. W. Wade, a junior student.

The Botanical Lectures have not been supported this year by the Associates; but this by no means indicates a want of interest in the subject, but more probably arises from the inconvenience of the time of lectures. The interest in the subject of Botany has been shown in the increased demand for books upon the subject, and by frequent inquiries for more convenient practical instruction.

An Excursion Club among the young men was proposed and discussed at several of your meetings, and resulted in the formation of the largest and most popular society ever formed in Liverpool for the practical study of natural science, which, under the name of the Liverpool Naturalists' Field Club, enrols above 350 members. Your Librarian, Mr. Walker, to whose persevering efforts the formation of this Club is due, holds the office of Honorary Treasurer. He has also established, for Associates of your Society, an Evening Class for the study of Botany at his house, conducted by Mr. H. S. Fisher.

The contributions to the Museum have been of a valuable character, although not so numerous as in some former years; but continued improvement may be anticipated as the Society increases, especially considering that the connexion of Liverpool with the commerce of the world offers peculiar facilities for procuring many valuable additions, especially those of a botanical character connected with medicine and the arts; amongst the donations, however, your Council refer with pleasure to that received from H. S. Maltass, Esq., of Smyrna, consisting of some varieties of opium, otto rose, sponge, squill, &c., &c.; and also one from P. L. Simmonds, Esq., of London, numbering 32 specimens.

Your Council observe, with great satisfaction, the success of the Bell Memorial Fund, which has been very generally supported by influential Members of the Medical Profession, who thus acknowledge the invaluable labours of the lamented Jacob Bell in the cause of Pharmaceutical Education. These Scholarships, and the formation of new Laboratories on the premises of the Pharmaceutical Society, form a suitable monument to his memory, and show that his successors are persevering in their efforts for the same end, and it is hoped that young men will eagerly avail themselves of these advantages.

The Council have much pleasure in apprising the Members that a munificent provision for the exhibition of new inventions and improvements in the arts has been made in the new Liverpool Museum, by William Brown, Esq., in addition to the building which he originally undertook to place at the disposal of the Town Council. It is a large quadrangular space, comprising a ground floor and two galleries, in that building, and is to be under the management of a joint Committee, representing the five learned societies of Liverpool, subject, however, to the regulations of the Town Council; and your Council, desirous of making some acknowledgment to Mr. Brown expressive of their high appreciation of his liberality in the advancement of Science, have elected him an Honorary Member of the Association, and have united with the other societies in presenting to him a suitable address, illuminated on vellum.

The Treasurer's report will be laid before you, from which you will perceive that the funds of the Association are in a satisfactory state, notwithstanding that some extra expenditure for gas-fittings, conversazione, books, microscope, &c., has been incurred since the last statement.

The Liverpool Chemists' Association, in account with R. Sumner, Treasurer.

Dr. SESSION 1859-60. Cr.

	£	s.	d.		£	s.	d.
To Cash paid for Books	17	6	7	By Cash in hand £35 6 9			
" Joiners' Work	2	18	0	" " Poison Fund 1 7 0			
" Microscope	4	4	0		36	13	9
" Printing	15	17	0	" Subscriptions from 135 Members	67	10	0
" Postages and Sundry Expenses (Secretary)	5	12	8	" " " 23 Associates	5	15	0
" Lecturer (Dr. Lankester)	3	3	0	" Proceeds of Soirée	11	8	9
" Refreshments (Soirée)	7	14	0	" Library Fines	3	4	2
" Gas Fittings	9	8	8	" Fees, Microscope	0	19	0
" Coffee and Attendance	14	9	10	" " Laboratory Students	56	3	6
" Delivering Circulars and Collecting	13	11	0				
" Rent	10	10	0				
" Dr. Edwards' Laboratory Fees	56	3	6				
" Repairs to Microscope	1	0	6				
" Cash in hand	19	15	5				
	£181	14	2		£181	14	2

To balance of Cash in hand £19 15 5

Examined and found correct, W. TOWNSON, THOMAS DOD, } *Auditors.*

September 28th, 1860.

Mr. SUMNER read the financial statement of accounts, from which it appeared that at the commencement of the year there was a balance in hand of £36 13*s.* 9*d.*, and at the close of the year a balance of £19 15*s.* 5*d.*

Mr. H. S. EVANS said he hoped the meeting would acknowledge the receipt, within the last ten days, of a very valuable collection of thirty-two articles for the Museum.

The CHAIRMAN moved the adoption of the report and statement of accounts, and observed that Mr. Simmonds, the donor referred to, was an author of some eminence. The donation had resulted from the great pleasure Mr. Simmonds had experienced when he visited the Museum.

Mr. REDFORD seconded the motion, which was carried by acclamation.

Mr. MERCER congratulated the Association on its prosperous condition, and expressed a hope that it would be as valuable to the profession in the future as it had been in the past. He then referred to the Library of the Association, which he stated was the most valuable collection of books on chemistry in this part of the country, and proceeded to pass a high encomium on W. Brown, Esq., for his noble gift at the Free Library to the learned societies of the town. He moved that the list of Members and the catalogue of the Library be printed.

The motion having been duly seconded, was agreed to.

The SECRETARY moved a vote of thanks to the lecturers, readers of papers, and donors during the year, which was passed amidst applause.

Thanks were voted to the office-bearers of the Association during the past year, on the motion of Dr. Ayrton, seconded by Mr. Pearson; and the compliment was acknowledged by the chairman.—A vote of thanks was accorded to the representatives of the press for their services during the year.

The meeting then proceeded to the election of Members of the Council in the place of Messrs. H. Coupland, J. B. Edwards, C. Jones, and W. Wright, who retired by rotation. They were all re-elected by considerable majorities.

A cordial vote of thanks was accorded to Mr. John Shaw, the Hon. Secretary of the Association, for his services during the last three years; and much regret was expressed that Mr. Shaw was unable to continue in office.

This concluded the business of the meeting.

The First Meeting of the Twelfth Session of this Association was held Oct. 11, 1860, at the Royal Institution, Dr. J. B. Edwards (who had been re-elected President for the ensuing year) in the Chair.

Messrs. J. Pyzer, A. E. Livsey, T. Kay, John Beynon, H. J. Brewer, T. Gibson, jun., S. Banner, John James Evans, Wm. King, John Thompson, and James Johnson, were elected Members, and Mr. James Melvin was elected an Associate.

The following donations to the Library and Museum were placed on the table:—A copy of Salmon's *Doron Medicum*, a curious work published in 1682, and *The Dispenser's Vade-Mecum*, from Mr. T. Britten. A large collection of valuable specimens from P. L. Simmonds, Esq., London, viz.:—Panacea, used for a drink, Brazil; Barba Timao, used in consumption, Brazil; Ptychotis Ajowain, Bombay; Verbena Tea, Aloysia citriodora; Kerntochii, Terminalia angustifolia; Datura sanguinea, Brazil; Grains d'Avignon, Rhamnus amygdalinus; Cachrys Tormentos; Ash leaves, Medicinal; Chay Root, Hedyotis umbellata; Boxwood Shavings, substituted for Guaiacum; Gingelli Seed; Coffee Berries, ungarbled; Odika Bread; Mylabris punctata; Persian Insect Powder, Pyrethrum Flowers; Palm Oil Kernels; Medical Wadding, from Pine-leaf wood; Salsify Coffee; Coffee Flights; Fibre from Rice Starch manufacture; Cape Weed; Softened China Grass ready for dressing; Refuse of Indian Corn Starch process, for feeding cattle; Refuse from Rice Starch manufacture; Cassava Starch, from Brazil; Cassava Meal, from Brazil; Starch, from Caraccas; Roasted Ground-nuts, Arachis hypogæa, used as coffee. There were also on the table the following books, which had been purchased by the Council for the Library since the last session:—Pratt's *British Flowering Plants, Ferns, Grasses, and Sedges*, seven volumes, with beautiful coloured illustrations; Parrish's *Practical Pharmacy;* last vol. of the *American Journal of Pharmacy*; last part of the *Microscopical Journal;* and three numbers of *Recreative Science.*

The Chairman expressed the pleasure he felt at meeting so numerous an attendance on the opening night of another session, and called the attention of the meeting to Mr. Simmonds's very handsome donation to their Museum, and the books added to the Library, which were then on the table.

The Secretary (Mr. T. D. Walker) said that the Council had placed upon him the duties of Honorary Secretary, which had been so ably discharged by Mr. Shaw during the last three years, and though he could not hope to succeed in discharging those duties so efficiently as his predecessor had done, he would promise to use every endeavour to give them satisfaction, and must throw himself upon their kind indulgence for all errors and short-comings, at the same time claiming the assistance of Members individually in providing matter for the various meetings during the coming Session. With reference to the Library, he trusted that it would be more extensively used than it had yet been, and that no Member or Associate would refrain from using it because of giving him trouble. They were well aware that during the six years he had been entrusted with the charge of their Library, he had devoted considerable attention to it; in fact, he had made it his hobby; and he assured them that the greater the demand made upon his services as Librarian, the better he was pleased; for he was firmly of opinion that the Library was one of the main supports of their Association, and in promoting its advancement they were adopting the surest means of securing the success of the Association as a whole. He had much pleasure in stating that the Council had decided on reducing the charge for the use of the microscope; it would in future be 1*s.* per week, or 6*d.* for two days, paid in advance, with an extra charge of 6*d.* per day beyond the time paid for.

Mr. H. S. Evans submitted a sample of some curious fruits, which had been sent from Africa, under the name of Essential Oil Nuts, to ascertain if they were of any commercial value. Mr. Evans had sent some to Sir W. Hooker, and read a letter from that gentleman, who did not know them, but from their structure and flavour, he thought they belonged to the same order as the Guinea Pepper.

Mr. Evans then read the paper of the evening, "On the Museum," in which he pointed out the advantages of such a Museum as theirs, the importance of making it as complete as possible, and the best means for securing to the fullest extent the benefits derivable from it.

A vote of thanks to the donors and Mr. Evans closed the proceedings.

NEWCASTLE AND GATESHEAD PHARMACEUTICAL ASSOCIATION.

The accommodation of this Society in their present rooms has not hitherto been quite satisfactory to the Members, though they were the best that could be obtained at the time they were required. The inconveniences attending them have been especially felt during the winter months, and the Members have wisely determined, in commencing the winter session of their school, to remove to more commodious premises which now offer near at hand.

We see that the Committee have announced a course of lectures by Mr. Wilson Proctor, on the Chemistry of the Metals, to occupy the Monday evening of each week during the months of November, December, and January. It is also stated on their circular that a series of evening meetings are to be commenced, for the purpose of reading and discussing papers on scientific subjects—these not being intended for the Students only, but generally for those interested in the objects of the Association. It is stated that papers for a number of these meetings are already promised.

ORIGINAL AND EXTRACTED ARTICLES.

FACTS AND FALLACIES CONNECTED WITH THE RESEARCH FOR ARSENIC AND ANTIMONY; WITH SUGGESTIONS FOR A METHOD OF SEPARATING THESE POISONS FROM ORGANIC MATTER.

BY ALFRED S. TAYLOR, M.D., F.R.S.

The processes which have been hitherto successfully employed by toxicologists for the detection of arsenic in the tissues are those of Marsh and Reinsch. Although the principles on which they are based are doubtless well known to the readers of the *Pharmaceutical Journal*, it is necessary to make a few observations upon them before proceeding to describe that method which, while it appears to me to combine the advantages of the two, is attended with less risk of fallacy than either process taken separately.

MARSH'S PROCESS.

Marsh's process consists in the conversion of the ordinary compounds of arsenic to arseniuretted hydrogen gas, in a properly constructed apparatus. In an early volume of "Guy's Reports" (vol. ii., p. 76, 1837), I published an account of Mr. Marsh's discovery, with a drawing of the apparatus used and recommended by him. Mr. Marsh confined his results to the combustion of the gas, the appearance of the metallic deposits, and the production of arsenious acid as one of the results of combustion. Since that date numerous forms of apparatus have been suggested; and the means of distinguishing arsenical from other deposits resembling them, have been described in most works on chemistry and toxicology.

It is conceded by all those who have experimented on the subject that, in the absence of disturbing causes, this is a most delicate process for the detection of arsenic. Mr. Marsh himself does not claim for it a higher degree of sensitiveness than that of enabling him to detect the 1-120th part of a grain of arsenic (the quantity contained in one minim of Fowler's solution); while, with regard to the effect of dilution, he found that one grain of arsenic in twenty-eight thousand grains (or four imperial pints) of water, furnished, when placed in a larger apparatus constructed for the purpose, upwards of one hundred distinct metallic arsenical crusts.* MM. Danger and Flandin assert that metallic deposits may be procured when the arsenic forms only 1-200,000th part of the liquid examined ("De l'Arsenic," p. 83); while M. Signoret states that he has procured metallic deposits with only the 1-200,000,000th part of arsenic in the

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* On the Separation of Arsenic, *Transactions of the Society of Arts*, vol. li., p. 10.

liquid. This is equivalent to one grain of arsenic dissolved in three thousand gallons of water. We must regard these results either as greatly exaggerated, or depending upon some peculiar mode of computation. In general, either the degree of dilution with water, or the supposed weight of the deposit derived from combustion, has been taken as the standard of delicacy; but the real question in practice is, what weight of arsenic can be detected in the minimum quantity of liquid required for use in Marsh's tube. From experiment I find, that deposits may be obtained from the 2000th part of a grain, and that they assume a reliable character, and admit of the application of corroborative tests when the weight of arsenic reaches the 1-100th of a grain. By a mode of operating different from that advised by Mr. Marsh, it is possible to extract and procure, in a visible metallic deposit, the whole of the metallic arsenic contained in the 2000th, and even in the 4000th part of a grain of arsenious acid; but to these small quantities it is difficult, if not impossible, to apply the requisite number of corroborative tests.

Mr. Marsh intended that his method of detecting arsenic should be substituted for the ordinary process of reduction and the use of the liquid and gaseous tests; but its claims to consideration rested upon an entirely different ground, namely, the power which it conferred on chemists, for the first time, of detecting the poison in the soft organs and fluids of the body. Up to the date of this discovery there were no chemical proofs that arsenic was absorbed or deposited in the tissues of the living body. In reference to the application of the process to organic substances, Mr. Marsh advised that, if the suspected substance was a solid, it should be boiled with two or three ounces of water, and the liquid filtered and introduced into the tube. If it was liquid, such as thick soup, the contents of the stomach, gruel, tea, cocoa, &c., he simply recommended that it should be thrown on a filter to separate the more solid parts, and that the liquid portion should be placed in the tube or inverted bottle in which the hydrogen was generated (p. 4). Thus, then, he brought every substance to the liquid state, while he made no attempt to separate the organic matter; or, when the poison was in small quantity, to reduce the bulk of the liquid by previous concentration. On the contrary, his plan simply consisted in enlarging his apparatus for large quantities of liquids (p. 9). In one experiment, he operated on half a gallon of water containing one grain of arsenic; and in another he states that he obtained equally satisfactory results from operating at once on *three pints* of very thick soup, the same quantity of port wine, porter, gruel, tea, &c. (p. 10). In these analyses of large quantities of liquids, the process of evolving the gas was allowed to proceed very slowly, and several days elapsed before the mixture ceased to give indications of the presence of arsenic. In order to prevent the effect of the frothing arising from the generation of hydrogen in an organic liquid, Mr. Marsh recommended the greasing or oiling of the shorter limb of the apparatus, before introducing the substance to be examined (p. 7). Having been a member of the committee that awarded to the late Mr. Marsh, in the year 1836, the large Gold Medal of the Society of Arts, for his ingenious discovery, and having seen him operate, I can confirm the correctness of the above extracts from his paper. Although, as he left it, his invention was a useful addition to the ordinary processes for detecting arsenic in clear liquids, it was quite unfitted for the detection of the poison when associated with much organic matter.

The first improvement on Marsh's method of analysis was made by Orfila, in 1839. This toxicologist deflagrated the organic matter in a dry state with nitrate of potash, according to a plan suggested by Rapp. He subsequently employed nitric acid, to destroy the organic matter; he then brought the mass, by evaporation, to a dry, carbonaceous state, and acted on the residue by nitro-hydrochloric acid. The arsenic was dissolved in water as arsenic acid, and in this state it was placed in the hydrogen apparatus. By means of these pro-

cesses, Orfila was enabled to concentrate the arsenic and to remove it from the organic matter; and thus, by the aid of Marsh's tube, he succeeded in detecting the poison in nearly all the organs and fluids of the body. MM. Danger and Flandin advised the carbonization of the organic matter by concentrated sulphuric acid and heat. Fresenius and Babo destroyed the organic matter by boiling the substance in a mixture of hydrochloric acid and chlorate of potash; and others, with a similar object, have employed chlorine and potash. In all these cases, the arsenic is more or less completely converted to arsenic acid, and in this state the presence of the poison is easily demonstrated. Analysts who have had occasion to employ these various methods of destroying organic matter, must have observed that, in some instances, they are liable to occasion a loss of arsenic; in others, they overload the liquid with chemical compounds, or in default of entire carbonization, they yield a dark, syrupy residue, which is liable to produce so much froth in the tube, as to render it difficult to procure arseniuretted hydrogen gas in a state fitted for testing. The use of nitric acid in large proportion, as advised by Orfila, is objectionable; for unless great care is subsequently taken to expel the whole of this acid, the arsenic is not in a proper state for separation, either by the process of Marsh or by that of Reinsch.

Apart from the great trouble and difficulty of procuring the organic liquid in a state fitted for evolving arseniuretted hydrogen, there are other obstacles to the reproduction of the gaseous compound in the presence of certain metallic and non-metallic substances. The presence of copper or mercury in a liquid, or of chlorate of potash, either interferes with the free production of arseniuretted hydrogen, or leads to its decomposition when produced. In addition to the fallacies pointed out by others, I may mention that in the course of the analyses made in Smethurst's case, I found that 1-96th of a grain of arseniate of potash mixed with a small quantity of solution of chlorate in the tube, did not give the slightest indication of the presence of arsenic. It was only when the proportion added was about 1-16th of a grain, that deposits were readily procured by the combustion of the gas. An exclusive reliance upon Marsh's process, when applied in the manner recommended by the discoverer, might, therefore, lead an analyst to the erroneous opinion that arsenic was absent, when the presence of the poison might be safely demonstrated by other methods of research.

Deposits or stains resembling those of arsenic, and liable to be mistaken for them, may also be met with under circumstances of which the conditions are but little understood. It was by some accidental result of this kind that Orfila was led to affirm that arsenic was a constituent of all flesh, and of animal matter generally. This statement was, however, subsequently proved to be unfounded, before a committee of the Institute. The cause of the fallacy which had misled so great an authority was not, however, satisfactorily explained. Antimony, phosphorus, selenium, sulphur, &c., and even iron and zinc, may, it is well known, so combine occasionally with hydrogen, as to deceive analysts, who rely upon the appearance of the deposits.

The process of Marsh may be employed either with or without the combustion of the arseniuretted hydrogen gas, and the examination of the products of its decomposition. Assuming that the gas is burnt in the manner recommended by the discoverer, namely, as it issues from a small jet, I believe that the best method at present known for determining the arsenical nature of the deposits, is the following: The deposits should be collected in small porcelain capsules. 1. Add strong *Nitric acid,* which dissolves the deposit, and evaporate the acid liquid on a sand-bath to dryness. A white deliquescent residue remains, which gives a reddish-coloured precipitate, with a solution of nitrate, or of ammonio-nitrate of silver (arseniate of silver). 2. A strong and fresh solution of *Chloride of lime* immediately dissolves the arsenical deposit, and on evaporating the

liquid to dryness, white arseniate of lime remains, which gives the red precipitate above mentioned, when nitrate of silver is added to it. 3. *Sulphide of ammonium* does not readily dissolve the deposit, but when mixed with it, enough is dissolved to leave, on evaporation, yellow sulphide of arsenic (orpiment), soluble in ammonia, but insoluble in cold hydrochloric acid. The pale, steel-blue colour of the flame, with the production of a white smoke (arsenious acid), and the metallic deposits or mirrors, received on glass or porcelain, are well-known characters of arseniuretted hydrogen gas in a state of combustion.

It has been suggested that the copper or silver tests might be applied to the produots by moistening surfaces of glass with the respective solutions, and holding them at a short distance above the flame, so that the arsenious acid evolved during combustion might be received upon them.

It is well known that *Antimony* combines with hydrogen, and that this gas, when burnt, produces deposits resembling those of arsenic. These may be collected in porcelain capsules, and tested by the method above described. 1. Strong *Nitric acid* dissolves the deposit. On evaporation to dryness, a white, insoluble compound is left (an insoluble oxide of antimony). Nitrate of silver added to this white residue produces no change, unless there was arsenic combined with the antimony, in which case a spot of red arseniate of silver will appear. If to the colourless mixture of oxide of antimony and nitrate of silver a small quantity of ammonia be added, or the stopper of a bottle containing ammonia be brought near, the residue in the capsule is immediately blackened, owing to the production of an insoluble compound of antimony and silver. 2. A strong solution of *Chloride of lime* does not readily dissolve the antimonial deposit. Even when heated on a sand-bath, there is no change, and the dry residue gives no red precipitate when treated with nitrate of silver. 3. *Sulphide of ammonium* readily dissolves the antimonial deposit: and on evaporation, red sulphide of antimony remains in the capsule, insoluble in ammonia, but easily dissolved by cold hydrochloric acid. Antimonial deposits are thus easily known from those of arsenic.

The flame of antimoniuretted hydrogen is of a pale yellowish-white colour. It furnishes black or smoky-looking deposits on glass or porcelain, which are remarkably different from the metallic-looking and brown-coloured deposits of arsenic. The white oxide of antimony, evolved by combustion, does not produce in the liquid tests for arsenic, held above the flame and within the vapour, any coloured precipitates. The ammonio-nitrate of silver is simply blackened as a result of the reduction of the metal.

Arsenic and antimony are thus very easily identified when Marsh's original process of burning the gas is resorted to. Many other distinctions have been suggested; but it is not necessary to specify these, as the above characters serve to distinguish the two metals clearly from each other, and both of them from all other metals known to chemists. The original process of Marsh is by no means so well adapted for the detection of antimony as of arsenic. The antimony, when introduced into the tube in a state of acid solution, if in small quantities, is liable to be rapidly precipitated on the zinc in the form of a black powder, and the current of gas soon ceases. When the 1-100th of a grain of tartar emetic was dissolved and placed in the tube with pure water and hydrochloric acid, there was not the slightest indication of the presence of antimony. It was only when the quantity amounted to about a grain that a number of well-marked deposits, in a state fitted for testing, could be procured by the combustion of the gas. In employing this process, we may meet with deposits so small and ambiguous from their thinness, that the corroborative tests may fail to show their nature. In this case, it will be advisable not to rely upon the combustion of the gas, but upon its decomposition by heat, and the reagents to be hereafter described.

As a result of this examination of the process of Marsh, it may be stated that there are two difficulties which the analyst encounters in resorting to it for the separation of arsenic from the solids or fluids of the body. First, there is no good or simple method of bringing the arsenic to a concentrated state, *i. e.* to a state fitted for testing without producing froth; and secondly, when the quantity of arsenic in an organic liquid is so small as to render the adoption of the process necessary, it is not possible to follow the plan of the inventor, of generating the hydrogen in the whole quantity of the organic liquid.

The chemical facts upon which this process is based, had been long known to scientific men, but it is not the less creditable to Mr. Marsh that he should have been the first to make a practical application of them for the detection of arsenic. Arseniuretted hydrogen was discovered by the Swedish chemist, Scheele, about the year 1775. He proved that it was a combustible gas, and that one of the results of its combustion was a regulus of (metallic) arsenic. Proust, in 1800, Trommsdorf, in 1803, and Stromeyer, in 1806, successively examined the gas, and described methods for its production. Stromeyer found that it burnt with a bluish-white flame, and that the products of its combustion were a mixture of arsenious acid and metallic arsenic (brown oxide of arsenic). Further, that it was decomposed by nitric and nitrous acids, by aqua regia, by chlorine, and a great number of metallic solutions, the products being water, arsenious and arsenic acids. In 1815, the gas was examined by Gehlen, and he discovered a new method of preparing it, by applying heat to a mixture of arsenic and caustic alkali. Its highly poisonous nature was demonstrated by the death of Gehlen from the respiration of a small quantity of the gas, during the performance of his experiments. An incautious manipulation with this gas has since led to fatal consequences in at least three cases. Every cubic inch contains one fourth of a cubic inch of arsenic in vapour, and an atmosphere containing one-tenth by volume of the gas is fatal to animal life (Berzelius). The gas contains by weight more than 96 per cent. of arsenic. It is very heavy, its specific gravity being 2.69. In 1830, Soubéiran published his researches on this compound. This chemist confirmed the results of Gehlen on the production of the gas by heating a concentrated alkaline solution with arsenic; and he also made the two important discoveries: 1st, that when a current of the gas was moderately heated in a tube by a spirit lamp, it was decomposed; and that arsenic of a bright metallic lustre was deposited on the interior of the tube; and 2ndly, that a solution of a salt of silver was decomposed by it, and that water and arsenious acid were the products of the decomposition.*

To Mr. Marsh alone is the credit due of applying some of these facts to a useful and practical purpose in toxicology, and the large number of processes which have been put forward since his time by various chemists as new inventions are nothing more than the adaptation of some of the above properties of the gas to Marsh's original process. The production of arseniuretted hydrogen from the action of an alkali on arsenic has been, in recent times, assigned to Fleitmann,—the decomposition of the gas by a solution of the nitrate of silver has been claimed by Lassaigne,—the method of decomposing it by heat has been described as the process of Berzelius, Liebig, or Chevallier, while the fixation and decomposition of it by nitric acid has been claimed by M. Meillet. It is, however, evident, from the remarks already made, that the whole of these properties of the gas were well known at the time of Marsh's discovery; and if the author himself did not make use of them, it was probably because he thought that those

* Payen, "Traité des Réactifs," 1841, Supplement, p. 5; Berzelius, "Traité de Chimie," 1829, tom. ii., p. 433; and "Manuel Pratique de l'Appareil de Marsh," par Chevallier et Barse, 1843, p. 60.

which he had selected would suffice in all cases for demonstrating the presence of the poison.

The frequent occurrence of arsenic as an impurity in sulphuric acid and zinc created for some years a degree of distrust in the results obtained by the application of Marsh's process. Some toxicologists employed hydrochloric acid in place of the sulphuric, but this is liable to contamination with arsenic as a result of the distillation of salt with arsenical sulphuric acid. A large quantity of impure sulphuric acid is annually manufactured in this country, chiefly for agricultural purposes. From the researches of Dr. Davy it would appear that arsenic is thus conveyed into manures; and crops grown from the manured soil are found to be more or less impregnated with the poison.* He found the proportion of arsenious acid contained in the commercial sulphuric acid to be one grain to an ounce. Dr. Rees found the proportion to be 13.5 grains in twelve fluid ounces, and Mr. Watson found 21.3 grains in the same quantity of acid. Zinc not unfrequently contains both arsenic and antimony, and Dr. Clark, of Aberdeen, informed me some years since that he had scarcely found a sample of zinc free from traces of arsenic. Within a recent period more care has been given to the purification of these substances, so that the acid and metal may now be obtained without difficulty in a state fitted for use in Marsh's process. It need hardly be observed, however, that they should not be employed in any investigation until they have been submitted to a preliminary testing in quantities equal to those which are to be employed in the process.

REINSCH'S PROCESS.

Hugo Reinsch first announced his discovery in 1841.† He accidentally observed that a piece of copper which he had immersed in commercial hydrochloric acid acquired, after a time, a dark-grey metallic deposit, resembling iron. This proved, on examination, to be a deposit of metallic arsenic derived from an impure sample of hydrochloric acid. The acid was found to contain one grain of arsenious acid in 500 grains. This deposition of arsenic was observed to take place on copper whether the acid was hot or cold, and whether it was concentrated or diluted, but in all cases heat was found to accelerate it considerably. Reinsch further ascertained that copper might be boiled in a solution of arsenious acid, or in pure hydrochloric acid, without any similar deposit being formed. Provided there is not too free an access of air, and the metallic copper is wholly immersed in the acid, the metal will remain unchanged for a much longer period in the concentrated than in the diluted acid. If there is a free exposure to air, the metal is rapidly dissolved (as subchloride) by the concentrated acid, but not by the diluted acid.

The proportion of acid to water which was found most convenient for the deposition of arsenic is not stated by Reinsch. One part of acid by measure to six, eight, or ten of water, have been the proportions generally adopted by analysts. From his experiments Reinsch drew the conclusion that the arsenic was so completely removed by copper on boiling it in the acid, that the residuary liquid gave no trace of the poison on the subsequent use of Marsh's apparatus. There were other and manifest conveniences attending the use of this method. The arsenic not being converted to a gas and burnt, there was no loss of the poison; it was entirely removed from the fluid in a state of pure metal, and the separation of it might be suspended and resumed at any subsequent period. Reinsch thought that his process was beyond the reach of any fallacy, because, when arsenic was really present in a liquid, even in small quantity, the deposit com-

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* "Philosophical Magazine," August, 1859, p. 108.

† Erdmann's "Journal für Praktische Chemie," No. 19, 1841. "Philosophical Magazine," No. 126, Dec., 1841. "Annales d'Hygiêne et de Médecine Légale," 1843, t. i., p. 439. See also a paper by the writer in the "British and Foreign Medical Review" for July, 1843, p. 281.

menced in a few minutes, and was completed in half an hour; and during this time, if arsenic was not present, the copper would be still bright on its surface, and present no appearance which could give rise to any error.* The facts upon which the discoverer relied for the demonstration of the presence of arsenic were—1, the grey, metallic appearance of the deposit; 2, the conversion of this deposit by a moderate heat to a crystalline sublimate of arsenious acid, in which the octahedral form of the crystals would be recognizable; 3, the solubility of these crystals in water, and the results of the application of the liquid reagents for arsenic to the solution. The only important addition which has been since made to these corroborative tests consists in the conversion of a sublimate of the crystals to arsenic acid by nitric acid, and the production of red arseniate of silver on the addition of a solution of nitrate of silver to the dry residue.

With the above-mentioned results, Reinsch pronounced his process to be entirely free from any fallacy, or from any possibility of error. He also thought that there could be no loss of arsenic. He asserted that it was the most delicate of all the processes hitherto contrived for the detection of this poison, and that it would reveal its presence even when it formed only the 1-200,000th part of the solution. This remark obviously applies to the mere effects of dilution. The actual weight of arsenic which can be detected in a minimum quantity of water is not assigned by Reinsch.

Most analysts who have had occasion to employ this process can corroborate the statement of the discoverer, to the fact that it is simple, delicate, and easy of application. In regard to its delicacy—if the disposition of a metallic film on copper is taken as a criterion, I can state, from direct experiment, that the 1-4000th part of a grain of arsenious acid admits of detection. This small quantity of arsenic, dissolved in a minim of water and mixed with ten minims of water and two of hydrochloric acid, gave a thin, but well marked, steel-blue coating to the twelfth part of a square inch of bright copper-foil. On the introduction of a second piece of the same size, there was scarcely any perceptible deposit. The arsenic in this experiment formed only the 1-96,000th part of the weight of the liquid in which it was dissolved. When, however, the quantity of water was increased threefold, there was no deposit on the copper, even after boiling for a few minutes. By a still longer boiling, and a concentration of the liquid, the arsenic would no doubt have revealed itself.

It is proper to remark, in this place, that the delicacy of the process is affected, not only by the quantity of liquid in which the arsenic is diffused, but by the surface of metallic copper employed in the experiment. For the detection of minute quantities, the polished copper-foil employed should not exceed the eighth of an inch square, and the arsenic should be diffused through a minimum of liquid. By thus diminishing the amount of metallic surface to be coated, it is easy to demonstrate that a quantity of arsenic may be detected by Reinsch's process which Marsh's process would entirely fail to reveal, even under its most improved modifications.

Reinsch makes but a slight reference to the use of his process for detecting arsenic in *organic matter*. He advises that the contents of the stomach and intestines should be boiled in pure hydrochloric acid mixed with distilled water, that the acid decoction should be filtered, and the filtered liquid boiled with one or more pieces of copper. The existence of arsenic might, he states, be in this manner demonstrated even in the bones, although he relates no experiment in support of this opinion.

At the date of publication of his process, it does not appear that Reinsch had

* "Annales d'Hygiène," 1843, i., 449. This view is not strictly correct; small quantities of arsenic or antimony contained in large quantities of organic matter require some hours' boiling for their entire separation and deposition.

practically applied it to the detection of arsenic in the fluids or solids of a dead body. He had no idea, apparently, of its important application to the separation of arsenic from the tissues. The only fact which I have found recorded on this subject is that he made a mixture composed of potatoes, soup, milk, &c., and introduced into it half a grain of arsenic. He boiled the whole with pure hydrochloric acid, diluted with its weight of water, filtered the liquid, and treated the filtrate with metallic copper. He found that the arsenical deposit was as easily obtained on the copper, in this experiment, as if acidulated water only had been used.

In the prosecution of his researches on arsenic, Reinsch found that *Antimony* formed an obstacle to the application of his process, as it did to that of Marsh. Tin and lead were not deposited under the circumstances; bismuth, mercury, and silver were deposited on copper, but in such a form as to create no difficulty to the analyst. The only serious objection was found to exist in antimony. This metal was precipitated on copper under precisely similar circumstances to arsenic. The colour was iron-grey, or, when the antimony was in very small proportion, of a peculiar reddish or violet tint. Reinsch placed great reliance upon this colour as evidence of the presence of antimony. It is always procurable by sufficiently diluting the antimonial liquid, or by reducing, if necessary, the proportion of antimony present. To distinguish by some positive characters the antimonial deposit on copper when it had acquired the iron-grey lustre of arsenic, was a problem left unsolved by Reinsch. He merely states that, if the copper, having on it the antimonial deposit, be heated, a white, amorphous film of oxide of antimony is sublimed in place of the well-marked crystalline sublimate yielded by the arsenical deposit on copper under similar circumstances. His process, therefore, in reference to antimony, was very imperfect. It served only to reveal the presence of arsenic, either when existing alone or when combined with antimony and deposited with it on copper. I have found, in operating on mixtures of small quantities of arsenic and antimony—when the acid liquid has been brought to the boiling point, and polished copper is plunged into it—that the antimony is first deposited in a violet film, which rapidly loses its colour by increasing in thickness, and by becoming coated with a layer of metallic arsenic. When heat is applied to the copper having on it a deposit of antimony or arsenic, or a mixture of the two, it will be found that arsenic is more easily volatilized. A heat of about 380° to 400° is sufficient to produce a crystalline sublimate of arsenic, and at this temperature antimony remains fixed; hence, in addition to the colour of the film, its fixedness at a moderate heat becomes an additional criterion of its antimonial nature.

One of the most simple and satisfactory methods of distinguishing the deposit of antimony on copper from that of arsenic, is to boil the copper in a weak solution of potash, containing no lead as impurity. This method was suggested by Mr. Watson, of Bolton, and was first employed by him in medico-legal analysis. By agitating the copper in the alkaline liquid, and occasionally exposing it to air in the tube in which the experiment is performed, the metallic antimony is rapidly oxidized and converted to a soluble antimoniate of potash. The alkaline liquid is poured off, or, if necessary, filtered,—acidulated with hydrochloric acid, and a current of washed sulphuretted hydrogen gas is then passed into it. An orange- or reddish-coloured sulphide of antimony is precipitated. This may be collected on a filter and washed with strong ammonia, in which it is insoluble. As sulphide of arsenic is quite soluble in ammonia, the insolubility of the precipitate in this menstruum is a proof of its antimonial character. Any sulphide of arsenic contained in the precipitate would of course be removed by ammonia at this stage of the process. If, as it frequently happens, the solution of potash contains lead, sulphuretted hydrogen should be passed at once into the alkaline solution, and the liquid filtered. Sulphide of lead is thus separated,

and sulphide of antimony may now be obtained from the alkaline filtrate by acidulating with hydrochloric acid.

In the late cases of antimonial poisoning at Liverpool, Dr. Miller, Dr. Edwards, and myself, carried the demonstration a stage further. The sulphide of antimony, collected on the filter, was boiled in strong and pure hydrochloric acid, and after the odour of sulphuretted hydrogen had disappeared, the acid liquid was introduced with pure zinc into a small Marsh's tube, constructed for the purpose, and the dried gas submitted to a red heat in a capillary glass tube. A well-marked metallic deposit, having the characters of antimony, was thus obtained. A certain quantity of precipitated sulphide is required for obtaining this additional corroboration.

If a sufficient quantity of oxide can be procured as a sublimate by heating one or more pieces of copper coated with antimony, this oxide may be dissolved in a small quantity of a strong solution of pure tartaric acid; and this solution, on being treated with a current of washed sulphuretted hydrogen gas, gives a precipitate of orange-red sulphide of antimony. This method was successfully adopted by Dr. Edwards in some of his numerous analyses in the Liverpool cases of antimonial poisoning (1860).

In "Guy's Reports" for October, 1856, Dr. Odling published a method of testing the antimonial deposit on copper by boiling the metal with a weak solution of permanganate of potash and potash. The antimony is here oxidized at the expense of the oxygen of the permanganate; by Mr. Watson's method it is simply oxidized by exposure to air. Of the two, the latter is less open to objection.

A method which I had previously adopted consisted in deflagrating the copper with the antimonial deposit in a mixture of nitrate and carbonate of soda. Antimoniate of soda was thus formed. This, when dissolved in water and acidulated with hydrochloric or tartaric acid, yielded, under a current of sulphuretted hydrogen gas, a deposit of sulphide of antimony, the colour of which, however, was liable to be obscured by an admixture with some sulphur. This mode of corroboration is not so delicate as that proposed by Mr. Watson.

The process of Reinsch, therefore, is now rendered as satisfactory for the detection of antimony as of arsenic; and by comparison with the process of Marsh, it is not only more delicate, but far more convenient in its application. Marsh's process may be used in the manner above described simply for corroboration.

In comparing the two processes for the separation of antimony from liquids, I have found that Reinsch's method is twenty times more delicate in revealing the presence of antimony than that of Marsh, as it is usually employed.

Thus, a minim of water containing the 1-2000th part of a grain of tartarized antimony, mixed with ten minims of water and two of hydrochloric acid, gave a violet-coloured deposit of metallic antimony on boiling in it a piece of pure copper-foil corresponding to one twelfth of a square inch. A second piece of equal size introduced came out of the liquid untarnished; hence all the antimony had been deposited. Estimated by the degree of dilution, the proportion of antimony here separated was not more than the 1-48,000th part of the liquid. These appear to be the limits of Reinsch's process for antimony; and it will be seen that it is twice as delicate for arsenic, since the 1-4000th part of a grain of the latter metal admits of separation as a visible deposit.

The introduction of Reinsch's method gave great facility to the detection of arsenic in the *tissues*. The organ or solid containing arsenic was cut up and boiled in the requisite proportions of water and acid; it yielded a liquid which readily gave a deposit of metallic arsenic on copper. In some cases the acid liquid was strained or filtered off and tested; in others, the copper was at once boiled with the organ cut into small pieces. In either case the long and trou-

blesome carbonization of the viscera was dispensed with; and the frothing in Marsh's process, as well as the ambiguous stains from a variety of substances, were no longer obstacles to the analyst. This method has been very extensively employed in this country in judicial researches. It has been used by Dr. Christison, Dr. Douglas Maclagan, Dr. Geoghegan, Mr. Watson, Mr. Herapath, and other analysts of repute for many years; and the result of their united experience appears to be, that it is admirably adapted for the detection and separation of arsenic from the tissues of the body.

The first record of its employment in this country for the detection of absorbed arsenic in the tissues, for medico-legal evidence, was in the case of Mrs. Gilmour, who was tried in Edinburgh, in January, 1844, on the charge of murdering her husband by poison. Dr. Christison found arsenic in comparatively large quantity in the liver, by boiling a portion of this organ with diluted muriatic acid and copper. This was the second instance in which, up to that date, the poison had been found in the liver in this country. In conjunction with Dr. Penny, of Glasgow, he has used this process up to a recent date, namely, in the case of Madeline Smith, who was tried at Edinburgh on a charge of poisoning, in June, 1857.* In the last edition of his "Poisons," p. 271, Dr. Christison says of the discovery of Reinsch, that "it forms the groundwork of the best process of all yet proposed for the detection of arsenic in solution." In short, those who have tried the two processes have in the end generally preferred that of Reinsch. Mr. Herapath, of Bristol, who has had great experience in the examination of cases of arsenical poisoning, states that he prefers, and has always acted upon, the principle first proposed by Reinsch.† With this strong testimony in its favour, it cannot be a matter of surprise that Reinsch's process has been, and still continues to be, so much employed by English analysts for the detection of arsenic in the dead body.

There is this difference between the two discoverers, Marsh and Reinsch—while the former suggested a useful application of facts already made known by others, the latter discovered for himself the simple fact upon which his process is based. Until within a recent period it was thought, too, that the materials used in the process of Reinsch were far less liable to give rise to fallacious results than the materials required for the process of Marsh. The investigations, however, which were carried out by Dr. Odling and myself in the case of Isabella Banks (the case of "The Queen against Smethurst," August, 1859), showed that there was a latent fallacy connected with the use of Reinsch's process, of the existence of which neither Reinsch nor any toxicologist of repute had had, up to that date, the slightest suspicion. This was the discovery of arsenic in all the best and so-called purest varieties of copper, whether as foil, gauze, or wire, and in sufficient proportion to give rise, under certain conditions, to fallacious results.

(*To be continued.*)

REPORT OF THE
RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION,
AND OF THE
APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

On Persian Opium.—Persian opium, which some time ago was but little known, has recently entered largely into commerce; the determination of its medicinal value, and its suitability for use in Pharmacy, has consequently become a matter of importance. Dr. O. Reveil, a Professor of Pharmacy in France, has been engaged

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* "Report of Trial by Irvine," 1857, p. 61.

† Ure's "Dictionary of Arts and Manufactures," Part I., November, 1859, p. 191.

upon this subject, and has published* the results of a very careful investigation, indicating a notable distinction between these opiums and those of Smyrna, &c., which are more commonly used.

Dr. Reveil, in his paper, quotes the description given by M. Guibourt, in his *Traité des Drogues Simples*, of a sample of Persian opium obtained from Mr. Morson, of London. This sample was in the form of cylindrical sticks, slightly flattened, or squared, by their reciprocal pressure. The sticks were enveloped in glossy paper, bound with cotton, and each weighed about twenty grammes. M. Guibourt remarks that the paste, although fine and homogenous, presented the appearance, when cut, of small agglutinated tears, but much smaller and more attenuated than in the case of Smyrna opium. It had a hepatic colour, a powerful odour, and a very bitter taste. It softened in contact with the air; cold water extracted 80.55 per cent., which was reduced to 78.76 by a second solution.

The opiums examined by Dr. Reveil differed in several respects from the sample thus described by M. Guibourt. Of the cylindrical form, several specimens were obtained by the author through M. Menier. They were all enveloped in highly glazed paper, which was sometimes white and sometimes rose-coloured, and bound with cotton. Each cylinder weighed exactly fifteen grammes; the colour was reddish-brown, resembling "café au lait;" the paste was very fine and compact, and the taste very bitter. It was slightly hygroscopic. This cylindrical opium was very soluble in water and alcohol. The specimens of M. Menier furnished the following analytical results:

Matter soluble in water			82.60
" " in spirit			81.60
Alkaloids	12.30	Morphia	8.15
		Narcotine	4.15

The process adopted by Dr. Reveil for the determination of the morphine and narcotine was originated by M. Guillermond fils, and since modified by M. Fordos and himself.

The aqueous solution of three samples, upon special examination, was found to contain a considerable quantity of grape sugar. It readily reduced the potassio tartrate of copper, and the solution underwent fermentation when mixed with yeast, furnishing alcohol and carbonic acid. The proportion of glucose present was estimated at 15 per cent.

The presence of sugar in these opiums, the property which they possess of attracting moisture from the air, and the fact of each cylinder weighing exactly fifteen grammes, has induced Dr. Reveil to regard them as fabricated products, and not the simple result of the evaporation of opium juice. The author conceives that it would be singular for a weight used in Persia to correspond so exactly with fifteen grammes of the French system. Moreover, he has always failed to detect sugar in the opiums of Constantinople; in those of Smyrna, on the contrary, a notable proportion of glucose is occasionally found. He conceives that the presence of this substance must be taken as an indication of falsification, because it has never been found in indigenous opiums.

Dr. Reveil also examined three other samples of Persian opium obtained from commerce, presenting totally different forms. The first specimen was in the form of spherical cakes, without any envelope or wrapping, and without any leaves or rumex capsules upon its surface. Its physical characters, in other respects, resembled the preceding samples. It was, however, rather more hygroscopic, and a slight sweetness was perceptible upon tasting it. It furnished the following analytical results:—

Matter soluble in water			84.20
" " in spirit			80.60
Alkaloids	12.0	Morphine	6.4
		Narcotine	5.6

It yielded 31.6 per cent of glucose.

The second specimen was in irregular masses, of an hepatic colour, very hygro-

* *Journal de Pharmacie.*

scopic, and devoid of all foreign substances. It yielded 13.9 per cent. of glucose. When ammonia was added to a solution of this opium, a very abundant yellowish-white gelatinous precipitate was obtained. Alcohol also determined a flocculent precipitate. This opium dissolved almost entirely in spirit, furnishing a thick viscous liquid. The following are the results of its analysis:—

Matter soluble in cold water			76.5
" " in spirit			93.7
Alkaloids	16.15	Morphine	7.1
		Narcotine	9.05

The third specimen of opium differed essentially from the preceding; it was in the form of flat cakes, wrapped in a leaf unknown to the author, and had upon its surface some rumex capsules, accompanied by the calyx. Its colour was reddish-brown. In taste and odour it resembled the preceding samples. It mixed less easily with spirit and water. It yielded 31.6 per cent. of glucose. The following analytical results were obtained:—

Matter soluble in water			79.2
" " in spirit			75.6
Alkaloids	15	Morphine	5.1
		Narcotine	9.9

Dr. Reveil points out the freedom from foreign bodies as a remarkable character in these opiums. Their peculiar colour, the very large relative proportion of narcotine and of glucose, all appear to indicate to the author that these various forms of Persian opium are not natural products, but are manufactured. He especially states that narcotine and the *pulp of apricots* are used in their preparation.

Dr. Reveil points out the inadmissibility of these opiums for Pharmaceutical preparations, on account of the small proportion of alkaloid, or rather of morphia, which would be contained in the matter extracted by the solvents employed. He especially points out the necessity for paying attention to this point in determining the value and uses of opium generally for Pharmaceutical purposes, and quotes some results in confirmation recently published in the *Journal de Pharmacie d'Anvers*, which show that a rich opium may sometimes furnish an extract poorer in morphia than one obtained from an opium containing less alkaloid, but at the same time less extractive matter. An opium (A.) containing 4.5 per cent. of morphia, furnished an extract which contained 6.32 per cent. of morphia. Another sample of opium (B.), containing 3.73 per cent. of morphia, yielded an extract containing 8.29 per cent. of morphia. The opium A. gave 68 per cent. extract, while B. only furnished 45 per cent.

Dr. Reveil also points out the necessity for separating the narcotine from the morphia before weighing, and recommends the use of chloroform for this purpose. He further states that the morphia should be dissolved in spirit, after separating the narcotine, to remove the earthy phosphates, which are sometimes present in the precipitated ammonia in considerable quantity.

On the Preparation of Nicotine.—M. Debose has proposed a process for the preparation of nicotine, which consists in mixing the tobacco with powdered lime and placing the mixture in a cylinder, one end of which is attached to a condenser, and the other connected with a steam boiler. When steam is passed through the apparatus, the nicotine is disengaged, and passes into the refrigerator, where it is condensed and collected with the water. To exhaust one pound of tobacco, the vapour of about four pounds of water is required. The condensed product contains, besides nicotine, ammonia and other volatile bases, the nature of which has not been determined. It is neutralized exactly with sulphuric acid, and then concentrated by evaporation. The resulting liquid is treated with an ethereal solution of ammonia, which displaces the nicotine; this base, being insoluble in the solution of sulphate of ammonia, is taken up by the ether, and the ethereal solution may then be mechanically separated. A simple rectification furnishes the nicotine in a sufficient state of purity.

The Preparation of Peroxide of Lead.—It is stated that binoxide of lead is now largely used in the manufacture of lucifer matches. M. Bœttger recommends that it should be prepared for this purpose by boiling acetate of lead with an excess of a solution of chloride of lime. Chloride of calcium, acetate of lime, and peroxide

of lead are the products of the reaction. This body may also be obtained by passing chlorine through water containing protoxide of lead in suspension, or by fusing litharge with nitre or chlorate of potash.

Do Plants assimilate Free or Uncombined Nitrogen?—Messrs. Lawes and Gilbert, in conjunction with Dr. Pugh, have presented to the Royal Society the results of an elaborate investigation of this question. The authors sum up the conclusions to be drawn from the whole inquiry as follows:—

The yield of nitrogen in the vegetation over a given area, within a given time, especially in the case of leguminous crops, is not satisfactorily explained by reference to the hitherto quantitatively determined supplies of *combined* nitrogen.

The results and conclusions hitherto recorded by different experimenters on the question whether plants assimilate free or uncombined nitrogen, are very conflicting.

The conditions provided in the experiments of the authors on this question were found to be quite consistent with the healthy development of various graminaceous plants, but not so much so for that of the leguminous plants experimented upon.

It is not probable that, under the circumstances of the experiments on assimilation, there would be any supply to the plants of an unaccounted quantity of combined nitrogen, due to the influence either of ozone or of nascent hydrogen.

It is not probable that there would be a loss of any of the combined nitrogen involved in an experiment on assimilation, due to the evolution of free nitrogen in the decomposition of organic matter, excepting in certain cases when it might be presupposed.

It is not probable that there would be any loss due to the evolution of free nitrogen from the nitrogenous constituents of the plants during growth.

In numerous experiments with graminaceous plants, under a wide range of conditions of growth, in no case was there any evidence of an assimilation of free nitrogen.

In experiments with leguminous plants the growth was less satisfactory, and the range of conditions was, therefore, more limited. But the results with these plants, so far as they go, do not indicate any assimilation of free nitrogen. It is desirable that the evidence of further experiments with such plants, under conditions of more healthy growth, should be obtained.

Results obtained with some other plants, are in the same sense as those with graminaceous and leguminous ones, in regard to the question of the assimilation of free nitrogen.

Seeing the evidence afforded of the non-assimilation of *free* nitrogen by plants, it is very desirable that the several actual or possible sources whence they may derive *combined* nitrogen should be more fully investigated, both qualitatively and quantitatively.

If it be established that plants do not assimilate free or uncombined nitrogen, the source of the large amount of combined nitrogen known to exist on the surface of the globe, and in the atmosphere, still awaits a satisfactory explanation.

On the Preparation of Carbonic Acid.—In the last number of this Journal, we inserted in the "Report" a notice of a suggestion which had been made by Messrs. Meschelynck and Lionnet for the preparation of Carbonic Acid on the large scale. We have since received a communication from Dr. Daughlish, in which he claims the process therein described as one of his own invention, and for which he has taken out a patent. It will be remembered that the process alluded to consisted in exposing carbonate of lime, or chalk, while at a dull red heat, to a current of steam, when it was stated that the carbonic acid was immediately and rapidly evolved.

Dr. Daughlish's process—or rather processes, for his specification describes two, which are perfectly distinct from each other in the method of operating—is as follows:—

An ordinary iron gas retort is set in a furnace in the usual manner, but, in order to make an air-tight fitting with the cover, an india-rubber washer is employed; this is protected from the heat by making water to circulate round the mouth of the retort and through the cover. A pipe passes from the retort, and is

connected with an air-pump, by means of which the air or gas can be drawn from the retort, and forced through water into suitable receivers. In working the apparatus, the retort is filled with chalk, the cover attached, and the charge brought up to a low red heat. The air-pump is then set to work, and the air which is drawn out of the retort is allowed to escape until carbonic acid is found to be coming over in a pure state; it is then directed into a cooling vessel, and from thence it passes to a gasometer, in which it is stored.

In the second mode of operating described by Dr. Daughlish, steam is employed, and it is to this method that the process of Messrs. Meschelynck and Lionnet bears a close resemblance. In this case earthen retorts are used, to prevent the decomposing action which the heated iron exerts upon the steam. In using steam the patentee does not commonly employ the vacuum; but when the two are used, the gas is obtained at a lower temperature than by the employment of either steam or the vacuum alone. The method of proceeding in the case of steam is the same that has already been described. The steam is admitted at the back of the retort, and the gas and steam are led away to the cooling vessel, where the steam is condensed and the gas cooled.

Dr. Daughlish expresses his claim in the following terms:—"The obtaining of carbonic acid gas from carbonate of lime and other carbonates of the alkaline earths, by distillation in closed vessels or retorts, and collecting the carbonic acid gas so obtained for use, as herein described; also, the employment of steam within the retort, to facilitate the separation of the carbonic acid gas; also, the maintaining of a vacuum within the retort during distillation, in order to facilitate the separation of the carbonic acid gas."

With the question of priority we have nothing to do; the statement of Messrs. Meschelynck and Lionnet was, however, published abroad previous to its appearance in our journal. Dr. Daughlish's patent was dated the 14th of January, 1859.

ON THE PROXIMATE ANALYSIS OF PLANTS AND VEGETABLE SUBSTANCES.

BY FREDERICK ROCHLEDER, M.D.

(*Continued from page* 220.)

II.—*Examination of the cold watery infusion.*

This fluid, prepared in the manner given at page 611, is divided into several parts.

The *first part* is introduced into a test tube, placed in a beaker glass filled with water, and the water slowly heated. By means of a thermometer inserted in the test tube, the temperature is observed. At a certain heat *a coagulation of one or the other constituents* is produced. When the coagulation of the substance is noticed, the lamp is removed from under the beaker glass, or the latter is taken from the sand-bath on which it has been placed to heat it. The object of this removal is to prevent the temperature of the fluid in the test tube rising any farther, and to retain it some time at the same heat, or rather to cool very slowly. The coagulum is separated after the fluid has cooled by the filtration of the fluid. To promote the filtration, it is better to take a number of small filters instead of a larger one, because the pores of the filter are quickly stopped by coagulated material of that kind, and the filtration then proceeds extremely slowly.

The filtrate is again treated as the original fluid, only the temperature is allowed in this second treatment to rise more quickly to the point where the separation takes place, and then slowly elevated. The fluid heated some degrees higher often throws off a fresh coagulum, which is likewise collected on a filter. The filter is again heated, to see whether by a still higher temperature a third coagulum makes its appearance. As all coagulable substances do not lose their solubility in water at the same temperature, several of these bodies may be separated from one another when they are simultaneously present in an aqueous extract.

The *second part* of the fluid is mixed with *acetic acid*, to ascertain whether a precipitate results. If a precipitate ensues, it is collected on a filter, of which several small ones are used, instead of a large one. The filtered fluid is now heated,

whereby generally a coagulum is formed. The substance precipitated by a little acetic acid is examined, to learn whether it is quite or partially soluble or not in acetic acid when an excess is added. By these means a separation of several of these bodies may be sometimes effected.

The *third part* is, lastly, mixed with *alcohol*, and it is observed whether a precipitate results, which nearly in all cases makes its appearance thereby in at least a small quantity. The precipitate collected on a filter and washed with spirit, is treated with *water*, whereby only in few cases a complete solution results. The filtered aqueous solution resulting is heated, by which frequently a considerable coagulum is thrown out.

III.—*Examination of the extract obtained by acidulated water.*

As already stated (page 612), this extract is employed for the detection of some organic acids, which *per se* are soluble in water, but are contained in the material under examination in the form of compounds, mostly as lime salts, which are neither soluble in pure water nor in spirit. It is also employed for the detection of organic bases. For example, when a part of a plant contains, as is frequently the case, oxalate of lime, the oxalic acid is neither found in the watery decoction nor in the spirituous extract, because oxalate of lime is equally insoluble in water and in spirit. By its decomposition, by means of sulphuric acid, which is added to the water, we obtain from the salt insoluble in water so much oxalic acid in a free state, that we can detect it in the fluid.

For its further investigation the acid extract is freed from its sulphuric acid by *carbonate of baryta*, which is added in small quantity. A precipitate of sulphate of baryta thereby ensues, mixed with more or less compounds of organic substances, or perhaps with precipitated organic bases, when they were present in the acid solution, and one or more of them were difficultly soluble or insoluble in water. The precipitate is collected on a filter and washed with water. The washed precipitate is *boiled with strong spirit*, and the spirituous solution is separated from the insoluble matter by a filter. It is ascertained whether the spirit has dissolved or not any organic bases. The baryta precipitate, boiled with spirit, is digested with dilute sulphuric acid, to produce sulphate of baryta, which is separated by a filter, and to obtain a solution of the substance which was combined with the baryta. The lime and baryta salts generally exhibit a very analogous degree of solubility, so that by this method mostly those compounds are obtained in solution whose lime salts being insoluble in water and spirit, could not be extracted by these fluids from the material under examination. The fluid which is filtered from the sulphate of baryta, excess of carbonate of baryta and organic baryta compounds, and perhaps precipitated organic bases, is then mixed with *sulphate of copper*, whereby sulphate of baryta is precipitated, when a soluble baryta salt has been formed and is contained in the fluid, as well as many compounds of the oxide of copper with organic substances. The precipitate is filtered off, washed with water, and decomposed under water by sulphuretted hydrogen. The undecomposed sulphate of baryta and sulphuret of copper are filtered off, and a watery solution of the organic substances which were combined with the oxide of copper is thus obtained. The filtrate is heated, for the expulsion of the sulphuretted hydrogen, in a flask or a tubulated retort, in a water bath, during which a stream of carbonic acid is led through the liquid. After this the fluid is mixed with *vinegar of lead* as long as a precipitate ensues. By these means all the acids not precipitated by the copper salt, with few exceptions, are thrown down. The precipitate, after it has been collected on a filter and washed with water, is boiled with *alcohol*, to extract the bases possibly precipitated with the lead compounds. With these some lead salts may of course be dissolved at the same time. The spirit is distilled from the fluid, which is freed from lead by sulphuretted hydrogen, and the bases are sought in the aqueous fluid filtered from the sulphuret of lead. *The fluid filtered from the precipitate produced by basic acetate of lead*, contains in the majority of cases the organic bases. The bases thus separated from most other bodies can be easily discovered therein. A portion of this fluid is employed for the detection of volatile bases, and another portion for the discovery of the bases not distillable with water, according to the directions which

are given on these points in the examination of the watery decoction (pages 25, 131, 162).

The acid fluid which has been obtained by the *digestion of the mixture of baryta salts with dilute sulphuric acid* is, by means of *fractional precipitation*, employed for the detection of the acids contained therein. *Acetate of baryta* is used for the fractional precipitation, which gives better results in this case than acetate of lead.

Volatile as well as non-volatile bases can indeed be separated in a shorter way from the acid extract: the former, by mixing the acid extract with an excess of a solution of potash and distillation; the latter, by infusion of galls and the like precipitants. But thereby we run in danger of overlooking some other constituents. On this account the ceremonious method of analysis here described is to be preferred.

IV.—*Examination of the extract obtained by ammoniacal water.*

This extract, as already mentioned (p. 612), is mixed with dilute hydrochloric acid, and the resulting precipitate, if any, collected on a filter, and washed with water. The precipitate is treated with hot spirit, to learn whether a portion, or the whole, of the precipitate dissolves or not *in spirit*. Generally the greater part remains behind, which consists of albuminous bodies which present in a coagulated condition or as legumine, are insoluble in a free condition in alcohol and water, but with ammonia afford compounds soluble in water. They are precipitated from their solutions by hydrochloric acid, and remain undissolved by the treatment with spirit. Among the bodies extracted by ammonia and precipitated by hydrochloric acid, and also in the part soluble in alcohol, of the mixture thus obtained, substances often exist which are extracted by alcohol from the material under examination, because they are not soluble in pure water, but are as soluble in ammoniacal water as in spirit; for example, chinovic acid, &c. We often obtain bodies of that kind purer from this ammoniacal extract than from a spirituous extract of the material, in which they are accompanied with many other substances, while in this case many of these substances are separated for the most part by the previous boiling with pure water, and thus do not interfere with their preparation in a pure state. It often happens *that substances combined with lime or magnesia are quite as insoluble in water and spirit as in ammoniacal water. When the substance combined with lime or magnesia is insoluble in acidulated water*, it can only be obtained in the following way from the material:—A portion of the material, boiled with water, is extracted with water containing hydrochloric acid, whereby the lime and magnesia compounds in question are decomposed, and the lime and magnesia dissolved as chlorides and removed. All that is soluble is separated by washing with pure water, and then the material is extracted with ammoniacal water, which now dissolves the organic body rendered free, which was insoluble as a lime or magnesia compound, and may be precipitated insoluble in water upon the addition of hydrochloric acid. *By the decoction of the material with spirit containing sulphuric acid*, after it has been already exhausted with spirit, these bodies may be obtained likewise; but we are in danger, by the action of the acid in the heat, of producing changes in the bodies we desire to isolate.

V.—Examination of the Spirituous Extract or Decoction.

a.—Precipitations from the spirituous extract or decoction.

From the spirituous extract of the substance under examination, when the extract is prepared with hot alcohol, bodies are deposited sometimes by its cooling, or after a portion of the spirit has been distilled off, which must be subjected to a closer examination. With a cold prepared infusion, deposits of that kind make their appearance generally after the distillation of the alcohol, but mostly in small quantities. Resins, kinds of wax, fats, with other peculiar bodies which belong to none of these classes—as, for example, saponine—are contained in these deposits, which frequently appear of a dark green colour like the spirituous extract itself, when vegetable substances containing chlorophyll have been extracted with spirit. Probably these may be partially separated by the employment of sulphuret of carbon, and thus the analysis facilitated. Unfortunately, at present such a few data lie before us upon the applicability of this fluid, which was first employed by Lampadius for

separations of that kind, that I am not in a position to give more information with regard to the employment of this body in the treatment of the mixtures in question. So much is certain, that the analysis of these mixtures belong often to the most difficult problems. As all fats, as well as kinds of wax, dissolve at least in hot ether, but only some of the resins, it is convenient to effect a separation by ether into a soluble part, and a part insoluble therein, and to examine both after distilling off the ether more closely, supposing that the whole mass is not soluble in ether, which often happens. Many bodies in such mixtures are soluble in hot or boiling alcohol, or, on the contrary, are difficultly soluble in cold alcohol, as, for example, many kinds of wax. A partial, if not an exact separation, can be effected by dissolving the mixture in the smallest possible quantity of *boiling alcohol*, and then cooling the solution. I shall come directly to a method for the separation of this mixture into its constituents. But I must here remark that fats, when present in great qnantity, as, for example, in the seeds poor in starch or in many roots, are seldom accompanied by resins in considerable quantity, and *vice versâ*, leaves, woods, flowers, &c., rich in resin, contain seldom more than a trace of fat, so that we have to do either with a preponderance of fats or a preponderance of resins, at least in the majority of cases. On the contrary, with resins, waxy substances frequently exist together. It has been already stated that vegetable bodies rich in fat are freed generally by pressure from the bulk of the fat, and the quantity of fat necessary for its investigation can be obtained almost in a pure condition. But fatty materials which cannot be rendered poor in fat by pressure as well as the press residues of others, are extracted with cold alcohol containing a large quantity of water, to obtain spirituous extracts as free as possible from fat, which are also examined (page 612).

I have therefore to give the method by which a mixture of resins containing waxy bodies and a mixture of fats are to be treated, to ascertain the individual constituents of these mixtures. *The mixture of resins*, which contains admixed waxy bodies, must, before it is submitted to investigation, be subjected to some preliminary experiments, which are performed with small quantities of it. *A small portion of the resinous mixture* is treated in a mortar with water to which a little ammonia has been added, and the resinous mass is kneaded with the pestle into the closest possible contact with the alkaline fluid. Many resins possess the character of weak acids. These resins *dissolve in the ammoniacal water*, while the indifferent resins remain undissolved by this treatment. By filtration the undissolved substances are separated from the solution, and from this the dissolved resins are thrown down by dilute hydrochloric acid. By these means the resinous mass is divided into two parts. *A second portion* of the resinous mixture is dissolved in spirit, when the method named effects no separation. But when a separation has been thereby effected, the part soluble in ammonia is dissolved in spirit. The spirituous solutions are mixed with *a solution of acetate of copper*, whereby many resins, but not all, are precipitated. *A third portion* of the resinous mixture is treated with ether, to effect, if possible, a separation. Both portions of resin which have been separated from one another by ammoniacal water are treated with ether, to produce a further separation. *A fourth greater quantity of the resinous mixture* is treated in the following manner:—The mixture is dissolved in spirit, and the solution precipitated with a *spirituous solution of acetate of lead* as long as a precipitate results. The fluid is separated from the precipitate by a filter, and this is washed on the filter with spirit. The washed precipitate is diffused in spirit, and a current of *sulphuretted hydrogen* is passed into the fluid, which is made hot by surrounding the vessel in which it is placed with hot water. After its complete decomposition, the solution is filtered hot from the sulphuret of lead in a water bath funnel. By the cooling of the filtrate the bulk of the substance separates, which was previously combined with the lead. A portion often remains dissolved, which may be procured by evaporation. Frequently in this way crystalline waxy compounds are obtained by cooling separated from the resins, while sometimes one resin or the other remains dissolved in the fluid. The fluid which is filtered from the precipitate which has been produced by the spirituous solution of acetate of lead, in the spirituous solution of the resinous mixture, is treated with sulphuretted hydrogen. The lead, as well as the chlorophyll when present, are thereby precipitated from the fluid. The sulphuret of lead is separated by filtration, and the spirit

of the solution by distillation, whereby the resins are precipitated. For the prevention of any alteration by heat, the distillation is undertaken in a water bath. The *resins* thereby obtained are treated with a *weak solution of caustic potash*, which separates the soluble from the insoluble part. The resulting solution is mixed with a watery solution of *chloride of calcium*, the resulting precipitate washed on a filter, and then dried by a gentle heat or *in vacuo*. The filtered fluid is mixed with *hydrochloric acid*, whereby a precipitate frequently makes its appearance, which is collected on a filter, washed with water, and then dissolved in *lime water*. A current of *carbonic acid gas* is conducted into the solution, by which a precipitation of organic substances often appears, which are separated from their combinations with lime by the carbonic acid. As this precipitate is contaminated with carbonate of lime, the salt is extracted with *dilute hydrochloric acid*, or the organic substances are separated from the lime salt *by alcohol*. The fluid filtered from the carbonate of lime and the organic substances is heated for the decomposition of the bicarbonate of lime present. The fluid is again filtered, and, when cold, treated with *dilute hydrochloric acid*, by which a precipitate of organic substances results, which, as a stronger acid, was not thrown down by the carbonic acid from the lime. The *lime salt*, prepared by precipitating with *chloride of calcium* the solution which was obtained by means of potash, is, after it is dried, treated with *ether*, which generally dissolves a portion of it, which is left behind by distilling off the ether in a water bath. The portion remaining undissolved in ether is treated with *alcohol*, which sometimes likewise dissolves a small portion. Lastly, that which is insoluble in ether and alcohol, is treated with *dilute hydrochloric acid* without the application of heat, for the separation of the lime. With these individual portions we shall have the opportunity of ascertaining which method of separation possesses the advantage over the others, and to treat correspondingly the whole mass of the resinous mixture.

When we have to operate on a *mixture of fats* which has been procured either by pressure between cold or heated plates, or by the extraction of the material with hot spirit, and distilling off the spirit and filtering the watery residue through a moist filter, whereby the fat remains on the filter, we proceed in the following way:—

A small portion of the fat is saponified with a solution of potash in a dish, *the solution of soap decomposed by a sufficient quantity of dilute sulphuric acid*, and the floating fatty mass separated from the watery fluid by a pipette or a small syphon; this fluid is *subjected to distillation* in a flask or a retort, after a refrigeratory apparatus and receiver have been connected with the distilling vessel. The distillate is tested after about two-thirds of the fluid have passed over, and the distillation is interrupted to ascertain whether it has or not an acid reaction, whether turbid or clear, whether oily globules have separated thereout, and whether it possesses an odour or not. When the distillate exhibits only a slight acid reaction, is almost odourless, quite clear, and oily globules float on its surface, no glyceryle compounds of the *volatile fatty acids* are present in quantity. On the other side, they are present when the distillate has a strong acid reaction, has thrown out oily globules, or at least when these render the distillate turbid or opalescent, and has a remarkable odour. *If no volatile fatty acids are present, the bulk of the fatty mixture is saponified with a solution of potash, the solution of soap mixed with common salt*, and the soap formed is separated. The soap is removed after some time from the aqueous fluid, and dissolved in water with the aid of heat. The solution is again treated with common salt, and the solution and the salting repeated frequently, until the watery saline fluid takes up no more foreign substances. *In the first ley*, from which the soap has been separated by common salt, is contained the chief bulk of the *glycerine; the soap* which has been purified by repeated solution and salting, is now *dissolved in water*, and precipitated with *a solution of sugar of lead;* the precipitate which results is a mixture of lead compounds, consisting of the lead salts of the fatty acids. This mixture of lead salts, after it has been washed and dried, is treated with *ether*, whereby the lead compounds of the volatile fatty acids are dissolved, but not those of the solid fatty acids, and which, after being washed with ether, are decomposed, which can be accomplished either by spirit containing sulphuric or hydrochloric acid, or by treatment with spirit and sulphuretted hydrogen. The fatty acids, freed from lead, and dissolved in spirit, are, after the greatest portion of the spirit has been distilled off, mixed with a solution of carbonate of potash as long as an effervescence thereby ensues, and then the spirit is

entirely expelled by evaporation. A little solution of caustic potash is now added, and the whole boiled to decompose a small quantity of the ethers of the fatty acids, which have formed by the decomposition of the lead salts with the spirit containing sulphuric or hydrochloric acid, and by the distillation of the spirit, have not quite volatilized, and to combine the fatty acids contained therein with potash. The excess of alkali is separated by salting the soap, which is then dissolved in water. *This solution of the potash salts of several fatty acids is now fractionally precipitated with acetate of magnesia, acetate of baryta, or acetate of lead*, according to the method of Heintz, by adding half of a solution of these salts, which has sufficed to throw down the whole of the fatty acids. The precipitate is filtered off, and washed. To the filtrate, the second half of the solution of the acetate employed is added, and the precipitation is thus completed. Both precipitates are now decomposed, and both resulting portions of the fatty acids are converted into ammoniacal salts in solution, and these solutions again divided into two parts, and precipitated by the acetate selected. This method of separation is continued until only one fatty acid is in combination with magnesia, lead, or baryta, in the individual parts. We learn whether the separation has been brought thereby to this point by decomposing a portion of a lead, magnesia, or baryta salt, converting the fatty acid or acids into a silver salt, and determining its atomic weight by heat. The bulk of the lead, magnesia, or baryta salt is then decomposed, of which a small portion has been taken for the preparation of the silver salt used for the determination of the atomic weight; the resulting free acids converted into ammoniacal salts, and these fractionally precipitated. After a silver salt has been prepared from the first and second half, the atomic weights of both silver salts are determined. When the atomic weights of the organic substance of both silver salts is the same, and equal to the atomic weight of the silver salt first estimated, the separation in this examined portion has been a complete one.

If not only *glyceryle compounds* of the non-volatile fatty acids, but those of the volatile acids, are contained in the fats, the method is modified in the following way:—The saponification is performed in a still, the *solution of soap* therein mixed with a solution of *tartaric acid*, and the whole subjected to *distillation*. After the head has been fixed, and a careful arrangement made for cooling, the volatile fatty acids are then found in the *distillate*, the non-volatile ones among the contents of the still. The distillate is so fractioned by *partial combination with a base*, and distillation as described in the examination of the watery distillate (page 130), which is obtained by the decoction of the material under examination with water. The non-volatile fatty acids, partly solid and partly fluid, are treated precisely as though they had been obtained by saponification from the fatty mixture alone, which was above spoken of.

The *volatile fatty acids*, which are obtained as ethereal solutions of their lead salts, by the treatment as above given of the salts of the fatty acids with ether, may be likewise mixtures of several volatile fatty acids. After the expulsion of the ether they must be separated from the lead and thrown down by *fractional precipitation* from one another, precisely as stated for the solid fatty acids.

Since it has been discovered that not only fatty acids, but also benzoic acid, may be contained in fatty mixtures as a glyceryle compound, it is no longer improbable that the glyceryle compounds of other acids besides those of the proper fatty acids, may be found in many fats when attention is directed thereto.

To ascertain *whether other acids of that kind besides the fatty are contained or not as glyceryle compounds* in the mixture of fats, *the fluid which is obtained when the fat is saponified, and the soap separated by common salt*, is filtered and evaporated in a water bath until it is reduced to a very small volume. Glycerine and common salt are always found in this residue, besides free potash, carbonate of potash, and small quantities of dissolved soap. If glyceryle compounds of benzoic acid or of other acids were contained besides in the fat, the potash salts of the acids are dissolved likewise in this fluid. *The residue*, which is obtained by evaporation, is divided into two parts. *The first part* is mixed with a solution of chloride of calcium, which precipitates a little carbonate of lime, as well as the compounds of small quantities of fatty acids with lime, which are insoluble in water. The lime salt of the acid, which is present in addition to the fatty acid, either precipitates or remains

dissolved. If it remains dissolved, a solution of the salt of the acid sought for is obtained by filtering the fluid from the carbonate of lime, as well as from the lime salts of the fatty acids; but the solution is contaminated with glycerine and common salt. This fluid is evaporated to concentrate it. The residue is mixed with *hydrochloric acid.* If benzoic acid, or any acid difficultly soluble in cold water, is present, it is precipitated by the addition of hydrochloric acid. When nothing is thrown down, either no acid or one very soluble in water was present. To arrive at certainty on this point, *a second portion* of the residue of evaporation above mentioned is precipitated with chloride of calcium, the resulting precipitate collected and washed with water, diffused in a little water, and mixed with *dilute sulphuric acid.* The decomposition is promoted by heat until it is completed. The fluid, still hot, is then filtered through a moist filter. If, with the fatty acids, another acid is precipitated by chloride of calcium, as a lime salt insoluble in water, it must be contained in this filtrate with a little free sulphuric acid. To discover the presence of an acid, which is neither difficultly soluble in water, nor gives with lime an insoluble salt, we proceed in the following way:—

A *portion of the fat* under examination *is saponified* by boiling with thin *milk of lime*, and the hot fluid containing glycerine is *filtered* from the lime soap. *Carbonic acid* is conducted into the *filtrate*, heated for the decomposition of the bicarbonate of lime, and filtered. The filtrate contains the lime salt of the acid sought for and glycerine. The fluid is mixed with basic acetate of lead, and the precipitate perchance resulting is separated by filtration from the fluid. The lead salt is washed with water, diffused in water, and decomposed by sulphuretted hydrogen. In the fluid filtered from the sulphuret of lead, the acid sought for is contained. There are only a few acids which produce no precipitate with basic acetate of lead. Should such an acid be present instead of basic acetate of lead, a solution of nitrate of silver mixed with a little ammonia is added, which precipitates a silver salt of the acid. If in this way no precipitation results, the concentrated fluid, wherein the acid and glycerine exist in solution, is digested with freshly precipitated carbonate of zinc or copper, and absolute alcohol is added to the filtered fluid, by which a zinc or copper salt of the acid is thrown down, but not the glycerine. When an acid which is volatile is mixed with the glyceryle compound in the fat, it will have been already found in the examination of the volatile fatty acids.

When fats and resins are mixed *with one another*, the mixture is treated with a solution of caustic potash, to effect the saponification of the fats. The electro-negative resins dissolve likewise as potash compounds therein, while the indifferent resins remain undissolved. After the insoluble part of the resin has been separated, *the solution of soap and resin soap* is treated with common salt, and the soap of the fatty acids is separated, but not the resin soap. The soap which has separated is treated as previously described (page 278). The solution of resin soap, which at the same time contains the glycerine of the fat, is mixed with *dilute hydrochloric or sulphuric acids*, whereby the resinous acids are separated. They often agglomerate, particularly when heated, and may be easily taken from the fluid and further purified. Sometimes it is necessary to evaporate the liquid, because a milky fluid results with acids which will not filter clear. *The resinous acids* separated are again dissolved in *a solution of potash*, and mixed with an excess of a strong solution of potash. By these means frequently a separation of several resinous acids is effected. Many potash salts of the resins are soluble, while others are insoluble in a concentrated solution of potash.

Before I conclude, the consideration of the mixtures of resins and fats separated from the spirituous extract, by cooling or distilling off the alcohol, I must direct attention to a point in the treatment of resins. *Many resins are copulated compounds.* Two resins are already known which break up into two products, one of which is grape sugar. It is also probable that not only are several resins such copulated carbo-hydrates, but that many resins are chiefly compounds, which, by the action of an acid or an alkali, may be split up into two products, one of which is not grape sugar. The resins must in this respect be more minutely examined.

This examination is conducted in the manner described (pages 164, 278) for the investigation of copulated compounds with acids and alkalies.

It is self-evident that by the presence of *several resinous acids*, their separation can

be accomplished in the same manner as this is effected with non-resinous acids, namely, by *fractional precipitation.*

When the spirit is distilled off from the alkaline extract, and the separated resins, fats, and wax-like bodies are separated from the watery residue, and the watery fluid freed from every trace of suspended substances by a moist filter, the series of examinations arrives at this *watery solution.*

(*To be continued.*)

NEW MODE OF APPLYING SULPHUR IN THE VINE MILDEW.

The following note by Mr. Mercieul, upon a new mode of applying sulphur in the vine disease, will serve as an answer to several correspondents:—

He selected a number of vine-stocks which last year had been attacked by the Oïdium so virulently, that not a berry had escaped its influence, and not a grape had been gathered. The vine-stocks were then divided into two groups, each of which contained a like number. The first group was put under treatment, and the second group left untouched, for the sake of comparison.

Towards the early part of last August, the Oïdium began to make its appearance upon both the groups. On the 15th, the following experiment was made on the first group:—The earth was raised from around the stems of the vine to the extent of about thirty centimetres (a foot), but to a varying depth—that is, as far as the first rootlets. Into each of the excavations thus made, a good handful of flowers of sulphur was placed, which was especially heaped around the stems. This done, the earth was replaced directly.* The vines were visited daily, and the following was their condition on the 20th of September:—

First group.—These vines were in the best condition, the grapes having a beautiful appearance. The ripening was as far advanced as the season permitted. The *mycelium* had not disappeared from the grapes which had been spotted with it at the time the experiment was made, but the disease had not made any further progress, and there was every reason to believe that they would come to maturity in due time. No new grapes had been attacked by the disease.

Second group.—These vines were in a deplorable condition. The Oïdium had made rapid progress; and there was every reason to believe that the grapes would be found, at the time of gathering, in as bad a condition as they were last year.

M. Mercieul states that he had no intention of making known the result of these first experiments, which, in order to be conclusive, ought to be repeated at a more favourable time—that is, in the winter; for in operating then we should have a twofold advantage, thus:—1st, the prophylactic would be then ready to act upon the sap at the commencement of vegetation in the spring; and 2nd, the hand-labour required to carry out the treatment would not be much more expensive than that required for the ordinary culture of the vines. He was induced, however, to state the above results to the members of the Vine Disease Commission at once, because by their being made public he thought that vine proprietors would be yet in time to try his mode of treatment, and thus be able, perhaps, to save grapes from their vineyards during the present season.

After having made known the above result, he says, that he ought to enter into some details as to the motives which had induced him to try the treatment alluded to above. The question he had proposed to himself was: Does the morbific principle of the Oïdium act locally, or upon the sap of the plant? and he had already made a number of comparative experiments to determine this matter, and had collected certain facts, by which he was led to the conclusion,—that the vine disease, called Oïdium, was a general affection, and that consequently a general treatment was alone desirable.

The author states that up to the present time, experimenters had exclusively confined themselves to local treatment; and that amongst the numerous processes in practice for arresting the disease, the application of sulphur by means of the bellows appeared to be most successful, but even that did not always succeed. He adds that the most experienced vine cultivators say that to combat the disease effectually, it is necessary to apply sulphur from its commencement, and to sulphur freely and

* Would it not be desirable to try the effect of sulphur, applied as above, in the potato disease?—Ed.

repeatedly. It seemed to him, therefore, easy to prove, that in thus profusely diffusing the sulphur was in reality a general treatment; in fact, the soil was impregnated with it by such a mode of procedure, and the plants were saturated with it in every possible way. When he had tried to cover with flowers of sulphur a certain number of grapes, and at the same time had taken care that it was diffused as little as possible on the soil and on the branches of the vines, no effect was produced upon the disease, even if the sulphur had been applied a great many times.—*Comptes Rendus*, Sept. 24th, 1860.

COLLECTION OF MASTIC AT CHIOS.

The mastic country, or rather that of the plant which produces it, the *Pistacia Lentiscus*, is especially the north of Africa, as well as some of the islands of the Grecian Archipelago, more particularly the island of Chios, which the Turks on this account call *Sachis Adassina*, that is to say, the island of mastic. Although this plant is found all about Greece and the islands of the Archipelago, and experience has shown that mastic may be always obtained from it by incisions, it is neglected everywhere, however, except at Chios, from whence comes in consequence all our commercial mastic. The villages where the inhabitants devote themselves exclusively to the collection of this resin are called *mastichochôra*, that is, mastic villages.

The incisions are made in the month of June with small knives especially adapted for the purpose, and towards the end of August they collect the mastic, which, having hardened on the plant, is readily detached. In order to gather it in a state of purity they spread under the shrubs some kind of cloth, as also some days before they take care to clean the soil, in order that it may not become attached to sand or other earthy impurities.

The smallest mastic, which is white and transparent, is reserved for the seraglio of the Sultan, and for the ladies of the harem, who kill time in masticating this resin, and it is from its use for this purpose that mastic derives its name from the Greek verb, *massaomai*. The choicest quality is called mastic for the seraglio, *Fliskari*. It costs three or four times as much as ordinary mastic, which they use in the preparation of several preserves called *mastix glyko*.

In the East they use an infusion of mastic, *mastico-nexon* (mastic water) for infantile cholera, which consists in diarrhœa and vomiting, a disease of which many children die during the period of dentition, and for which medicines are not often of use. The Greeks also use mastic in the form of poultices, made with red wine and bread, which they apply over the lower-belly; these poultices are called *Krasocôma*, from *krasi*, wine, and *cômi*, bread.

They only adulterate mastic by mixing it with some that is older, and the fraud consists in this, that the last has lost with its transparency its odour and flavour. Mastic is always a dear article, and at Chios even the oke (2.8326 lbs.) is worth from 200 to 300 piastres or more. (From about £1 13*s*. 4*d*. to £2 10*s*.)

Mastic chewing being in general use, the poor have recourse to another vegetable production, which they call *pseudo-mastic*. This is a gummy secretion which is found between the segments of the calyx of *Atractylis gummifera*, a plant rather common in Greece and the East.

It is remarkable that they always use toothpicks of *Lentiscus* as in the time of the Romans, who called them *dentiscalpia* or *cuspides lentisci*.—*Echo Méd. Suisse*, July, 1860; and *Journal de Pharmacie et de Chimie*, September, 1860.

KUKUI, OR KEKUNE OIL.

BY M. C. COOKE.

Now that the oil of *Aleurites triloba* is spoken of so highly in France as a purgative oil, a few particulars concerning it may not prove uninteresting.

The plant producing the fruits from whence this oil is extracted, belongs to the natural order Euphorbiaceæ, and is plentiful in the Sandwich, Society, and other groups of islands in the Southern Seas. It is also to be met with in some parts of Jamaica and the East Indies. The oil has been for some time known in Jamaica as Spanish walnut oil, and in India as Belgaum walnut oil. In Ceylon the oil is called *kekune oil*, and in the Sandwich Islands *kukui oil*. The tree is known in some parts

of Polynesia as the candle nut tree. The fruits are nearly as large as a walnut, and the kernel is enclosed in a thick hard shell. These nuts are often strung together by the natives, and burnt, without any other preparation, as torches. In the history of the Mutiny of the Bounty, it is stated that the rooms in Pitcairn's Island were lighted up by torches made of "doodoe" nuts, strung upon the fibres of the palm-leaf, forming a good substitute for candles. These nuts are also so strung and used by the San Blas Indians in Central America, and a child is in attendance to knock off each nut as it becomes burnt out.

The following is the method adopted in obtaining the oil in Jamaica. Each nut is carefully cracked or broken, and the kernel as carefully separated from the hard shell, lest the latter, having a brown dye quality, should affect the colour of the oil. The kernel is then put into a large mortar and pounded as fine as possible. It is afterwards thrown into a caldron with plenty of water and boiled. It is allowed to simmer for hours, until all the oil is well extracted and floats on the surface. Meanwhile, and until all is gathered together, the oil is skimmed off into another clean vessel. The oil thus collected is then boiled over again in a smaller vessel for a short time, in order to throw off any aqueous particles remaining after the first skimming. If the oil is not then perfectly pellucid it is run through blotting paper. Eight quarts of kernels will yield about three pints of oil. The yearly produce of this oil in the Sandwich Islands is about 10,000 gallons. It has been shipped to the markets of Chili, New South Wales, and London, but hitherto without much profit. It realized about £20 per imperial ton in London. In 1843, about 8620 gallons were shipped from Honolulu, valued at 1*s.* 8*d.* per gallon.

This oil has been used as an artist's oil, for which purpose it is said to possess valuable qualities, although it cannot be applied as a drying oil. It is only lately that attention has been called to its medicinal properties. It is purely purging, and, not like the croton, jatropha, caper-spurge, sandbox, and other euphorbiaceous oils, productive of vomiting at the same time. It is affirmed to be as mild as castor oil, and being more fluid, is better to take. It is without either taste or smell.

The nuts have, within the past twelve months, been sold in the London market under the name of kukui nuts, and there is no doubt that, upon inquiry, some of the oil could be procured, and it evidently well merits the attention of the profession. A purgative oil which shall possess all the advantages, and none of the disadvantages of castor oil, is a desideratum worthy of being secured.—*The London Medical Review.*

YELLOW POPPY SEED OIL.

M. Cloez, of Paris, has recently made known the result of some experiments relative to the Yellow Horned Poppy, *Glaucium luteum*, Scop., which is found on some parts of our shores. It is common all round the Mediterranean, and up the Western Coast of Europe to Scandinavia. It expands its handsome yellow flowers during July and August, which are succeeded by elongated capsules, containing a large number of minute seeds. These seeds lose only 8 per cent. of water when dried in an oven; and, after drying, contain 42½ per cent. of a siccative oil, which can be used as an aliment, or for burning. In its ordinary state the seed yields, by pressure, 32 per cent. of this oil. The marc, or residue, constitutes a valuable manure, giving, on analysis, six per cent. of nitrogen, and an ash, amounting to 14½ per cent., rich in phosphate of lime. This oil, without doubt, resembles greatly the poppy-seed oil, obtained from *Papaver somniferum*, and the plant might be cultivated for the sake of its seeds on our sandy shores, where nothing else remunerative can be produced; but we question whether it would yield anything like as much seed per acre as the opium poppy, and, therefore, whether it would pay to cultivate it for that purpose. M. Cloez's results, however, are worthy of being recorded.—*The Technologist.*

THE CONGRESS OF CHEMISTS AT CARLSRUHE.

We are enabled to give the following summary of the proceedings at the above congress through the kindness of a correspondent. The first meeting was held on Monday, the 3rd of September, under the presidency of M. Weltzein. MM. Wurtz, Roscoe, Schischkoff, Strecker, and Kékulé, were appointed secretaries, and after

other elections and preparatory discussions the sitting closed, and the members fraternised together at a banquet laid for 120 persons in the large hall of the Museum. This supplementary meeting, which was not mentioned in the programme, was by no means the least scientific, the least relished, nor, above all, the least substantial, as we learn from the Abbé Moigno.

On Tuesday, the 4th of September, the work commenced. M. Boussingault, who was chosen at the first meeting to preside for the day, called forward the secretaries, who in the interval between the 2nd and 3rd of September had prepared the following questions, to be submitted to the assembly for discussion.

1st. Would it be judicious to establish a difference between the word *atom* and *molecule?*

2nd. Would it be judicious to designate by the term *molecule* the smallest quantity of a body capable of entering into combination?

3rd. Would it be judicious to designate by the word *atom* the smallest quantity of a body existing in combination?

4th. Should the term *compound atom* be suppressed, and replaced by the words *residue* or *radical?*

5. Is the idea of equivalents empirical and independent of the idea of *atom* or *molecule?*

Professor Kékulé spoke upon the three first questions, and explained the motive which had induced the commission to frame them in this language. It was necessary to distinguish *atom* from *molecule;* furthermore, he insisted at length upon the distinction which ought to be established, at least in his opinion, between the *physical* and *chemical* molecule, which are not always identical. His opinion was, that the size of the chemical molecule would always be of value in aiding purely chemical researches, and without the help of any physical considerations.

Professor Cannizzaro, of Genoa, in an impromptu speech, at once remarkable both for profundity and style, combated the ideas of M. Kékulé. In his opinion, the chemical and physical molecules were absolutely identical; they could not be distinct one from the other. The gaseous molecule represented the chemical molecule, and it was impossible to conceive any other idea of a molecule. In the second place, the value of the chemical molecule could only be established in a certain manner, that is to say, by the *vapour-density*, which alone could serve to establish the true formula of a compound.

M. Secretary Wurtz resumed the discussion, and suggested that they should withhold any decision upon the distinction raised between the physical and the chemical molecule. He thought that upon the three first questions they would all agree, and passed on to the fourth proposition, expressed in these words:—Is it necessary to replace the word *compound atom* by one of the expressions *residue* or *radical?* Many chemists spoke upon this subject, particularly MM. Miller, Kékulé, Strecker, Persoz, Cannizzaro, and Béchamp. Their opinions were all more or less divergent. Other terms were proposed to replace the expression *compound atom*, but after a very long discussion the president suggested they should adjourn their decision, as the assembly seemed divided as to the resolution they should come to. A few minutes before the end of the meeting, a loud applause announced the entrance of M. Dumas, of the *Institut.* The commissioner-general invited this illustrious foreigner to take a seat near the president's chair, and fresh applause bore witness to the value that the assembly attached to the presence of this eminent savant, whose works have contributed so largely to the progress of chemical philosophy. The secretaries then read the last proposition of the commission:—Is the idea of equivalents empirical and independent of the idea of *atom* or *molecule?* No one thinking himself sufficiently strong on this point to give an opinion, the proposition was put to the vote, and adopted.

At the request of M. Boussingault, the chair was offered to Mr. Hermann Kopp, for the next day's meeting. M. Kopp, alleging the necessity which he was under to leave Carlsruhe that day, thanked the assembly, but declined the honour. M. Boussingault then proposed M. Dumas, who was ordained president by acclamation. The programme of the day being concluded, the meeting rose at three o'clock.

On Wednesday, 5th September, M. Dumas in the chair. After the usual routine business, the president invited MM. Miller, Anderson, and Will to take their seats

near him. The secretaries, in the name of the commission, then read the following propositions inscribed in the day's programme:—

1. Would it be desirable to place chemical notation in harmony with the progress of science?

2. Would it be judicious to adopt the principles of Berzelius, with the introduction of the necessary modifications?

3. Should any new signs be added to the number of symbols now in use?

M. Cannizzaro spoke first. The first question only required asking to be answered. They need not trouble much on that point. An ardent defender of the unitary system, he did not see it was necessary to preserve the notation of Berzelius, but would entirely adopt that of Gerhardt. A compromise which would modify the binary system, to introduce part of the unitary system, seemed to him quite inadmissible; it would oblige chemists to retrograde. It seemed to him far preferable to start from Gerhardt's theory, and to discuss his plan and modify it in certain parts if necessary; moreover, the reform introduced by the celebrated professor was not an abrupt leap, but was allied to all that preceded it. If Gerhardt had not introduced this reform another certainly would. The eloquent professor of Genoa then discussed the fundamental ideas of the unitary system; in his remarkable plea in favour of the theories of Gerhardt, he was obliged to show the impossibility, in the actual state of science, to adopt any other notation than that of the unitary school. He ended by asking all to admit, at least in principle, the new notation, and consequently employ the barred letters to represent the simple bodies corresponding to two volumes.

MM. Strecker, Kékulé, Will, Erdmann, and Kopp, spoke successively, some to corroborate the proofs given by M. Cannizzaro, and to strengthen the doctrine which he defended so valiantly, and others to combat it. All agreeing, however, to adopt the use of the barred letters.

The President resumed the discussion. He thought that the time had not yet arrived to adopt a definite method of notation; he wished to see at once added to the system of Berzelius the modifications which were rendered necessary by the recent progress of organic chemistry, whilst waiting for the final settlement of the question. One important point to which he called the attention of the congress was the necessity of looking at the requirements of instruction. In this respect, unity in language and in theory seemed to be most desirable. He considered, then, that by the preservation of an entire freedom in the drawing up of scientific memoirs, the professors should try to smooth as much as possible the difficulties produced by the divergence in these theoretical ideas. The President concluded by expressing the hope that this meeting would not be the last, and that next year the European chemists would again meet to discuss some of the points of a science cultivated at present with so much ardour and success. M. Dumas thanked, in the name of the assembly, the general commissioner, for the zeal with which he had organized the congress; and begged M. Weltzein to express to H.R.H. the Grand-Duke, who was absent from Carlsruhe, the thanks of the members of the congress. The session was then pronounced closed.—*Chemical News*, Oct. 20th.

MISCELLANEA.

Silvering Lead Tubing.—Mr. John Matthews, of New York, has taken out a patent for the above. Many attempts have been hitherto made to silver the interior of lead and other tubing employed in mineral water apparatus and for other purposes, by the voltaic process, but it has hitherto been found impossible to effect a uniform deposition of the silver throughout the whole length, or even to obtain any deposition beyond a short distance from the ends of the tubing. The object of this invention is to obtain by such process a uniform deposition of the silver on every part of the interior of a piece of tubing of any length, and to this end the invention consists in the employment as the bath or decomposition cell of the tube itself; also in the use, for the purpose of conducting the galvanic current and for replenishing the supply of the coating metal, of a rod or wire passing through the tube in the direction of its length; also in the extension or stretching of the tube and central conductor by means of screw threads and nuts, or their equivalents attached to their

ends, for the purpose of keeping them straight and thereby providing for the more ready insertion of the central conductor within the tube, and for the prevention of metallic contact; also in the use of non-conducting supports between the interior of the tube and the exterior of the central conductor, for the purpose of preventing the conductor coming in contact with the tube, and preserving a uniform distance between them in all parts; also in providing for the movement of the central conductor and its non-conducting supports within the tube to permit the deposition of the metal on all parts of the interior of the lead pipe, which could not take place if the supports were stationary; and lastly, in connecting the poles of the battery at opposite ends of the tube and central conductor to ensure uniformity of deposit throughout the whole length of the tube.—*Chemical News.*

A New Kind of Bronze.—This compound is described in the *Manchester Guardian* as being as tenacious as steel, and well adapted, from its great durability, for bearings in machinery. It is made by melting together 10 parts of aluminium with 90 parts of copper. It is found to answer for pistol barrels, and will be tried for rifles and cannon.

Duty on Books and Paper.—On and after the 16th day of August, 1860, the following duties of customs will be charged on importation from France, and likewise from Algeria, if the produce thereof, into Great Britain and Ireland, viz.:—Books, being of editions printed in or since the year 1801, bound or unbound, the cwt., 16*s.*; books, admitted under treaties of international copyright, the cwt., 15*s.*; millboards, the cwt., 16*s.* Paper, viz.:—Brown paper, made of old rope or cordage only, without separating or extracting the pitch or tar therefrom, and without any mixture of other materials therewith, the cwt., 16*s.*; printed, painted, or stained paper-hangings, or flock paper, the cwt., 14*s.*; gilt, stained, coloured, embossed, and all fancy kinds, not being paper-hangings, the cwt., 16*s.*; waste paper, or paper of any sort, not particularly enumerated or described, not otherwise charged with duty, the cwt., 16*s.*; pasteboard, the cwt., 15*s.* Prints and drawings, viz.:—Plain or coloured, the cwt., 16*s.*; admitted under treaties of international copyright, the cwt., 15*s.*; or, at the option of the importer, single, each, ½*d.*; bound, the dozen, 1½*d.*

Statistics of the Indigenous Roots, Barks, &c., with their Products, of the United States.—The following table does not include any articles but those used for medicinal purposes—nor ginseng, about 50,000 pounds of which are annually received at the port of Cincinnati:—

Table of Resinoids, Extracts, &c., manufactured at Cincinnati, for the Year ending May 1st, 1860.

Resinoids	150,000 ounces.
Extracts, Inspissated Juices, &c.	26,500 pounds.
Essential Tinctures	4,000 "
Tinctures, Syrups, &c.	50,000 "

Of Podophyllin and Leptandrin, about equal quantities are prepared, and the two constitute more than one-half of all the resinoids produced.

For the preparation of the above-enumerated articles, at least 250,000 pounds of the roots, &c., are required.

The sales of the crude, bruised, and powdered roots, barks, &c., we estimate at 310,000 pounds, making an aggregate of 560,000 pounds, sold and manufactured in this city during the year; the average value of which can not be less than one hundred and fifty thousand dollars, giving employment to a large number of persons, who are engaged in the collection, drying, and manufacture of these home productions.—*American Journal of Pharmacy*, September, 1860.

A Village of Arsenic-eaters.—A stream called Whitbeck, rising in the Blackcombe Mountains, in West Cumberland, contains arsenic in determinable quantity. The arsenic is most probably derived from veins of arsenical cobalt ore, through which it percolates; for a few yards above the source of the beck there is the entrance of a mine which is very rich in arsenical ore. The arsenical water is habitually used for every purpose by the inhabitants of the little village of Whitbeck, and with beneficial results so apparent that one might be justified in paradoxi-

cally characterizing it as a very wholesome poison, the deadly elements in dilution being productive of the most sanitary effects! Ducks will not live if confined to the Whitbeck, and while trout abound in all the neighbouring rivulets, no fins are ever found in the arsenicated stream. But its use by the villagers does not give rise to any symptoms of arsenical poisoning, but rather to the effects which are observed in Styria among the arsenic-eaters there. When the railway was being carried past Whitbeck the first use of the water produced the usual marked effects on the throats both of the men and horses employed on the works. The soreness of mouth from which they at first suffered soon, however, disappeared, and the horses gave rise to that sleekness of coat assigned as one of the effects produced by the administration of minute but repeated doses of arsenic. It is a question how far the rosy looks of the Whitbeck children, and the old age which a large proportion of the inhabitants of the village attain, are to be attributed to the arsenic present in the water.—*Westmoreland Gazette.*

Poisoning by Aconite.—A case of poisoning by aconite root is described by Mr. J. B. Brown, in the *Lancet* of Oct. 6th, arising from the accidental use of aconite root in the place of horseradish. A pound of the aconite root was cut into slices and mixed with a gallon of pickles. Four members of a family partook of the pickles, and were attacked with violent spasms, and severe pains, with prickling sensation in the limbs, and partial loss of sight. Chloric ether and ammonia were given in full doses. Two of the patients who had taken a large quantity of the vinegar suffered more severely, and in these cases mustard poultices were applied to the chest and back of the neck, and galvanism employed, in addition to the other remedies. All the patients gradually recovered.

Poisoning by Opium.—On Monday, Oct. 8th, an inquest was held at the Coopers' Arms, Queen Street, Chelsea, before Mr. G. E. Brent, deputy coroner for West Middlesex, on the body of Jane Pole, an illegitimate child, aged five weeks, who was stated to have been poisoned by the administration of opium. It was proved in evidence that the mother, Eliza Pole, was a single woman living with her mother and stepfather, at No. 1, Pratt's Buildings. The child had been suffering from the thrush in the mouth; some castor oil had been given, but the child had had no medical attendance, and had cried incessantly for three days. On Wednesday, Oct. 3rd, the stepfather, named Jones, procured some opium, of which he gave $2\frac{1}{2}$ grains to the mother, desiring her to give some to the child to put it to sleep. He broke off a piece about the size of a pin's head, which was given to the child, who was afterwards fed with bread and water and a little peppermint. The child went to sleep, but soon afterwards the mother observing a change in the child, a surgeon was sent for. On his arrival he found the child narcotized, the breathing irregular, and the countenance of a purplish appearance. A paper containing opium, and labelled "Opium, Poison," was given him, some of which he was told had been given to the child. He sent an emetic, but the child was beyond treatment, and died about 12 o'clock on the following day. The *post-mortem* examination showed the body to be perfectly healthy. The stomach, which was paralyzed, contained food, and a small piece of opium; the cause of death being the administration of opium. It was stated that the stepfather Jones, was a drunkard, and that he was not sober when he gave the opium, and then went to bed desiring that a second dose should be given at 9 o'clock. Jones, in defence, said that when in India he was in the habit of taking 5 or 10 grains of opium, and he thought a small quantity would only put the child to sleep. The deputy coroner was not satisfied that all the evidence had been brought out, and therefore adjourned the inquiry.

Suicide by Essential Oil of Bitter Almonds.—A market-gardener, named Satchell, was on Tuesday, Oct. 9th, found dead in his cottage in the Albion Road, Hammersmith. An empty glass and a small bottle, containing essential oil of bitter almonds, were found by his side, and also a pocket-book, in which was written the following:—"Weary of life ever since last year, in consequence of my landlords not having fulfilled their promise in draining the ground. I have lost two crops, which has hurt my brain; that is the cause of this act.—R. Satchell."

At an inquest held on Friday, Oct. 12th, the following verdict was returned: "That the deceased committed suicide in a state of mind unknown."

Attempted Suicide by Arsenic.—On Tuesday, Sept. 25th, Francis Concannon, a careworn looking man, was brought before Mr. Selfe, at the Thames Police Court, charged with attempting to commit self-destruction. It appeared that the prisoner, who was a steady and industrious man, and had been for some time in the employment of Messrs. Pontifix and Wood, at Millwall, was troubled with a drunken and disorderly wife, who squandered his hard earnings in drink. This, it appears, preyed heavily on his mind, and in a fit of despondency and vexation he went on Tuesday, the 8th of Sept., to a tub of arsenic on his employers' premises, filled a spoon with the poison and put it into a jug, on which he poured some water, and after mixing it well, swallowed the dose. A woman employed on the works suspecting that he had taken poison, raised an alarm, and he was immediately conveyed to the Dreadnought Hospital Ship, where he received instant attention. Powerful emetics were administered, and the stomach pump used, by which means the poison was dislodged before it had taken much effect on the system.

ALLEGED POISONING BY ARSENIC.

On Wednesday, Oct. 3, Emma Stringer, about 26 years of age, and Matilda and Abigail Stringer, her two younger sisters, were brought before the magistrates at the Wakefield Court House, the elder prisoner charged with the murder of Miss Adamson, by the administration of small doses of arsenic, and the two younger prisoners as being accessaries. Mr. Shaw, barrister of Wakefield, instructed by Mr. Fernandez, appeared to prosecute, and Mr. Wheelhouse, barrister of Leeds, instructed by Mr. Stringer, for the defence. It was found that there was no case against the two younger prisoners, who were discharged, on undertaking to appear if called on.

In consequence of rumours relative to the death of Miss Adamson, the body was exhumed, and an inquest held, which had been adjourned from time to time in order to obtain evidence. The following are the principal facts of the case as elicited at the inquest:—

The deceased was sister to the Rev. Sandford J. Cyril Adamson, perpetual curate of Padiham, Lancashire, but they were somewhat on cool terms, owing to religious differences—she being a Roman Catholic—and consequently they never associated. Deceased was possessed of independent means, and lived a quiet retired life, her household consisting of herself, her servant Emma Stringer, and an old man named Wood. The girl Stringer is also a Catholic, and appears to have occupied the position of a sort of confidential servant. The deceased, for three months prior to her death, was ailing, but not to such an extent as to cause any serious alarm to her medical adviser. On the 8th of August, however, she was seized with vomiting and purging, for which Mr. Hirst, surgeon, administered medicine to her, his impression being that she was suffering from peritonitis. It appears, however, that there was no purging or vomiting from the 5th of August up to the time of her death. She died on the 15th, in the arms of the servant girl, and a certificate of death was given by Mr. Hirst, in which he stated the cause of death to be peritonitis. Stringer attempted to dispose of some of the property of the deceased, on the ground that it had been given to her by the deceased, and this caused suspicion to be excited, which ultimately became so strong that an order for the exhumation of the body was issued by the coroner; and subsequently it was found that she had died from arsenical poison.

Mr. Thomas Nunneley, of Leeds, surgeon, deposed to making an analysis of the different parts of the body of the deceased, and stated generally that in all the parts that had come under his examination arsenic in considerable quantities had been found. The results he stated to be, that there was no evidence of any disease in the viscera which would account for death; that the appearance of the œsophagus and the portion of the stomach and duodenum seen by him, and the rectum, were such as the presence of arsenic would account for; that arsenic was administered into the stomach at a period not long antecedent to death; that death was caused by arsenic; that not only had arsenic been taken directly before death, but had also been administered at some considerable period before death, and probably on repeated

occasions; that considering the symptoms of the last illness, the appearances of the body after death, the results of the chemical analysis of the different parts of the body, and the character of the attacks from which deceased suffered during the last two or three years of her life, it was highly probable that the said attacks were really due to administration of arsenic, and not to natural disease. Mr. Hirst, who attended the deceased in her last illness, and who supposed she died from peritonitis, declared that during the time he attended deceased he gave her no arsenical preparation.

It was proved that at the sale of Miss Adamson's furniture on the 29th of August, a packet was found in the kitchen containing a white powder, labelled "Arsenic, Poison," which by way of precaution was thrown into the fire. Mr. Taylor, of the firm of Taylor & Mountain, proved that at Miss Adamson's request by letter, he had supplied an arsenical and mercurial preparation for the purpose of killing rats, but had never supplied Emma Stringer with arsenic or any other poison.

At the inquiry before the magistrates, Oct. 3rd, Mr. Shaw, on opening the case, called the attention of the Court to the fact that Mr. Waddington, the surgeon who attended Miss Adamson for some years before the prisoner went to live with Miss Adamson, was not called in during the repeated illness of the deceased, and that Mr. Hirst, the medical attendent of Emma Stringer, was called in a short time before the death of the deceased.

Dr. E. Waddington, of Wakefield, deposed that he made a *post-mortem* examination of the body, and that he witnessed Dr. Nunneley take away a portion of the contents of the body for analysis; he had also analyzed a portion of the contents of the viscera by Reinsch's test, for the discovery of arsenic, but found none; he found a suspicious appearance on the copper, but would not swear that it was arsenic. He did not boil the copper in muriatic acid before using it as a test, but rubbed it bright and made it perfectly clean. The reason he did not use Marsh's test was because he could not rely on the zinc being pure.

Mr. Hall, superintendent of police, deposed, that when he apprehended the prisoner and her two sisters, he produced a search warrant empowering him to search the house for a document purporting to be a will of Miss Adamson, and the prisoner said that her mother had burnt it. The mother said, "Yes, I burnt it, that there should be no more bother about it." The prisoner said, "Miss Adamson said I was to have all the things, and that old Mrs. Bateson can prove."

The *Rev. Mr. Barron* and the *Rev. Mr. Young*, Roman Catholic priests, and confidential advisers of Miss Adamson, repeated at great length their evidence given at the inquest respecting the disposal of the property of the deceased.

Mr. Wheelhouse objected to any evidence being given of the document which had been shown to the Rev. Mr. Barron purporting to be a making over of the property of Miss Adamson to Emma Stringer, as being illegal evidence, but the magistrates overruled the objection.

Mr. Nunneley repeated his evidence as given at the inquest, and deposed positively to having found arsenic in the portions of the viscera he had analyzed, and was fully convinced that Miss Adamson died from the effects of that poison.

Witness was cross-examined by Mr. Wheelhouse, but his evidence was not shaken.

Mr. Nunneley said he was a witness for Palmer, and in his opinion Palmer was hanged improperly, for he did not believe now that strychnine was found in the bodies of the persons whom it was alleged he had poisoned. When he made the analysis of the viscera of Miss Adamson he found poison, and pointed it out to Mr. Waddington, who was present. He was assisted in his analysis by Mr. Reynolds, of Leeds.

After some unimportant evidence had been given, *Mr. Wheelhouse* addressed the Bench, commenting in strong terms upon the animus which had been manifested by the counsel and the gentlemen engaged in the prosecution against the prisoner, and contended that there was no evidence to show that if the deceased did die of poison the prisoner at the bar administered it to her. Mr. Shaw having summed up the evidence, the magistrates fully committed the prisoner to take her trial at the next York Assizes.

SHIPMENT OF DANGEROUS ARTICLES.

On Thursday, Oct. 11th, Mr. Lewis Stewart, a merchant, having offices at 8, Cowper's Court, Cornhill, attended before the Lord Mayor, in answer to a summons obtained at the instance of the Peninsular and Oriental Steam Navigation Company, charging him with unlawfully sending by a ship called the Pera, belonging to the company, "certain goods of a dangerous nature, to wit, one gallon of sweet spirit of nitre and one pint of compound spirit of ether, without distinctly marking their nature respectively on the outside of the packages containing the same, or otherwise giving notice in writing to the master or owners of the said ship at or before the time of sending the same to be shipped, contrary to section 329 of the Merchant Shipping Act of 1854." It may be stated that the section in question, specially framed for the preservation of life and property, imposes a penalty of £100 for its infringement.

Mr. Tindal Atkinson, barrister, instructed by Messrs. M'Leod, Stenning, and Watney, conducted the case of the Peninsular and Oriental Steam Navigation Company; and the defendant was represented by *Mr. Nicholson*, solicitor, of Lime Street. Mr. C. W. Howell, the secretary, and several other gentlemen connected with the company, were present at the inquiry, as was also Dr. Letheby, who had been summoned as a witness.

Mr. Stewart, the defendant, pleaded "Not Guilty" to the charge.

Mr. Tindal Atkinson, in opening his case, after some remarks on the nature of the company, and its incorporation by royal charter, stated that their printed conditions for the conveyance of light packages and parcels contained a notice to shippers in conspicuous type, to the effect that the company would not receive on board their vessels any goods of a dangerous or damaging nature, and that if any such goods were shipped without notice, the shippers would not only be liable to penalties imposed by statute, but also for all damages sustained in consequence of such shipment. The present complaint was preferred under the Merchant Shipping Act of 1854, and the company had felt themselves bound in the public interest to make it, in order that it might operate as a wholesome caution against the infringement of the statute by persons sending goods or property to distant parts of the world by the company's vessels. The 329th section of the Act provided that—

"No person shall be entitled to carry in any ships, or to require the master or owner of any ship to carry therein, any aquafortis, or oil of vitriol, gunpowder, or any other goods which, in the judgment of such master or owner, are of a dangerous nature; and if any person carries or sends by any ship any goods of a dangerous nature, without distinctly marking their nature on the outside of the package containing the same, or otherwise giving notice in writing to the master or owner, at or before the time of carrying or sending the same to be shipped, he shall for every such offence incur a penalty of not exceeding £100, and the master or owner of any ship may refuse to take on board any parcel that he suspects to contain goods of a dangerous nature, and may require them to be opened to ascertain the fact."

The facts were these. On the 29th of September, Mr. Lewis Stewart, the defendant, who is a merchant carrying on business at 8, Cowper's Court, Cornhill, sent four packages to be shipped by the company's vessel the Pera, at Southampton, for Singapore. Before the goods were shipped he should distinctly bring home to the defendant, that in a printed form supplied to him at the offices of the company in Leadenhall Street, he described the contents of the packages as "apothecary's wares," and that, besides, he must have seen a notice, conspicuously printed and posted in the company's offices, as follows:—

"Caution to Shippers and Shipping Agents.—Life and property having in several instances been placed in great peril in consequence of the shipment on board the company's steamers of dangerous articles, under a declaration stating that the cases containing such articles were filled with others of a different and harmless nature, the directors hereby give notice, that instructions have been issued to all the company's commanders and agents to send home legal evidence in every instance in which it is discovered, either on board the steamer or at the port of delivery, that a wrongful declaration of the contents of any box or package (with a view secretly to convey such dangerous articles) has been made, so as to enable the company to

proceed against the shippers for the penalty by law provided. The penalty imposed by the Merchant Shipping Act for shipping goods of a dangerous nature without notice is £100, but shippers are warned that in the event of the destruction of or damage to other property arising from the fraudulent transmission of dangerous articles, the parties making such false declaration are liable by law for the full amount of all the damages that may be sustained through their misconduct.

"By order of the Board, C. W. Howell, Sec.

"Peninsular and Oriental Steam Navigation Company,
122, Leadenhall Street, London, Jan. 1, 1860."

The boxes, which were marked "S." within a diamond, "Singapore," and "Apothecary Wares," were sent to the Nine Elms station on the 29th of September, where they were received by a servant of the Peninsular and Oriental Company, and sent by rail to Southampton on the 1st of October, where they were shipped on board the Pera, which was to sail on the 4th. Fortunately, on the 3rd, a leakage was discovered from one of the boxes, and in consequence of the peculiar character of a vapour which arose from the box, it was opened, and found to contain three jars, one of sweet spirits of nitre, which was broken, one of ammonia, and one of balsam of copaiba, the two last of which were not considered dangerous. The boxes were immediately landed from the vessel, and the circumstance was telegraphed to the defendant in London. The defendant replied that he did not know the contents of the packages, that he had them from Messrs. Davy and Mackmurdo, manufacturing chemists, in Upper Thames Street, and he produced the invoice of that firm, in which the items spirits of nitre and sulphuric ether appeared among others. What the company contended, and not unreasonably, was, that Mr. Stewart should have had the cases in question marked "Dangerous," or have given some intimation to them of their contents, and that the mere inscribing cases containing articles so highly explosive was altogether insufficient. Besides, they submitted that it was wrong to pack such articles in straw and in wooden boxes, as these were packed, and that the usual plan of packing dangerous articles in sawdust and in tin cases, hermetically sealed, should have been adopted. He should call Dr. Letheby, who would describe the exceedingly volatile, inflammable, and dangerous character of both the sweet spirits of nitre and of the sulphuric ether. Had such articles, the tendency of which (besides their inflammable nature), under certain conditions of temperature, was to burst the vessels containing them, been by any chance placed near the engine-room of the ship, the consequences to all on board might have been horrible beyond description. It would be unwise to fetter the trade of this great metropolis by unreasonable restrictions; but this was one of those cases in which the lives of scores of human beings at sea, and far beyond the reach of aid or possibility of escape, might any day be placed under circumstances of peril fearful to contemplate; and his clients had felt it their duty, in the public interest more than in their own, to prefer this complaint.

Mr. Nicholson, on the part of the defendant, took a preliminary objection to the proceedings, contending that the company suspecting from the smell of the leakage that the packages were of a dangerous nature, had availed themselves of the power given by the Act to open them, and to refuse to carry them. There was an end of the matter. It was hard on Mr. Stewart, that he, being an innocent party, should be held amenable in such a proceeding.

The Lord Mayor, after hearing Mr. Atkinson in reply, said the goods having been placed on board the vessel, he thought the objection was untenable.

Mr. E. M. Gillson, the second master of the Pera, deposed to the four packages in question being put on board the vessel at Southampton, one of which was marked "Glass," "S." within a diamond, "Singapore." He could only speak to the marking of that one. On the afternoon of the 2nd of October he discovered a leakage in one of the packages by a strong odour which was being emitted from it. (Dr. Letheby handed the witness a phial containing spirits of nitre.) The odour was of that character, and was very powerful indeed. That and the other packages were unshipped next morning by order of the superintendent.

Cross-examined.—The case which leaked was put on board on the 2nd of October, and he discovered the leakage immediately it was shipped. After the case was

opened next morning, he observed that the jar from which the odour proceeded was broken into several pieces. He could not account for its being broken unless the fracture arose from the strength of the spirits it contained. (A laugh).

Mr. F. Buckland, chief clerk of the freight department of the Peninsular and Oriental Company at Southampton, proved the relanding of the cases on the morning of the 3rd, and that he was present when the one which leaked was opened. The other three cases, which were not opened, were sent to the company's offices in London.

Mr. Charles Wellington Howell, secretary to the company, proved that it was incorporated by royal charter, and that he was present with the defendant when two of the packages were opened, and in one of which was a bottle containing sulphuric ether.

By the *Lord Mayor*.—There was no external mark indicating that they contained inflammable matter. The word "Glass" was inscribed on each of them. When the packages were being examined, Mr. Stewart, the defendant, said he had shipped them, not knowing the dangerous character of their contents.

Mr. Tindal Atkinson put in the shipping declaration signed by the defendant, and which stated that the contents were apothecary wares. He also put in the invoice supplied to the defendant by Davy and Mackmurdo, and which contained, among others, the items, "Hoffman's anodyne, and spirits of nitre."

Dr. Letheby, in reply to questions by Mr. Atkinson, said—From the course of my scientific inquiries I am acquainted with the properties of *spiritus etheris nitrici*, or, as it is popularly called, sweet spirits of nitre. It is a mixture of one part of very volatile ether, called *hyponitrous ether*, and four parts of spirits of wine. You cannot freeze it. Its specific gravity is about 2-10ths less than that of water, or as 8 to 10. It mixes with water, but has a tendency to float unless agitated. It is volatile at ordinary temperatures. The pure ether itself boils at a temperature of 70°, which is below the temperature of a ship's hold in a warm climate. The spirit of nitre begins to boil at a temperature of 130°, and gradually rises to 170°. There would be two effects from the leakage of a vapour so compounded mixing with the atmosphere: first, the injurious effect to those inhaling it, for, like chloroform, it is a powerful agent in producing insensibility, and it will take fire at a point several yards away from the surface of the liquid, which I can prove by an experiment. (The witness put into a dry quart bottle in court about twenty drops of the spirit of nitre, and in a few minutes the vapour diffused itself throughout the atmosphere of the bottle. He then applied a light to the mouth of the bottle, when a sheet of flame passed through the liquid to the bottom of the bottle with a slight explosion.) If it mixes with about thirty parts of atmospheric air, I find it forms a most powerful and explosive compound. A gallon of the liquid spirit of nitre will produce about 400 gallons of vapour, and this, with thirty times its bulk of air, would form 2000 cubic feet of a powerful explosive mixture. The spirit of sulphuric ether, commonly called Hoffman's anodyne, is a mixture of one part of pure ether and two parts of rectified spirits of wine, with a little essential oil of wine. Its properties are essentially the same as the other. It is a powerful narcotic. The spirit of nitric ether is a little more volatile than the sulphuric ether. I can form no opinion as to the temperature of a ship's hold on a voyage to India. Cases packed like the one in question, and containing such articles, I think would be dangerous things in a warm place in the hold of a vessel. If by any chance they were placed near the engine-room, where the temperature was high, the spirit might reach the boiling-point, and burst the bottle.

Cross-examined by Mr. Nicholson.—It is pure nitric ether that boils at 70°. It would not make much difference if the nitric ether had a specific gravity of 8.50, instead of 8.30. The boiling point of every liquid means the atmospheric pressure of its vapour on the containing vessel. I don't think the fracture of the jar in this case took place from the boiling of the liquid; I believe it arose from some other cause. If a case so packed as the one in question were exposed in the hold of a vessel to a temperature of 90°, it would be a mere question of time—of a few hours or days—for the heat to reach the bottle.

Mr. Gillson was recalled, and stated that the temperature on the deck of the Pera at Alexandria in the month of June last ranged from 93° to 97°. He did not keep a register of the temperature in the hold at that time, but in the engine-room he had known it as high as 120°, and even above that.

This was the complainants' case.

Mr. Nicholson said the simple facts as respected his client, Mr. Stewart, were, that he received a letter from a friend in Singapore, who is a surgeon, requesting him to order certain goods from Messrs. Davy and Mackmurdo, of Upper Thames Street; that he did so, having no knowledge of the properties of the goods; and that he trusted to their being properly packed by that firm. He himself took no part in their packing or shipping. He merely handed the list sent by the surgeon in Singapore to Messrs. Davy and Mackmurdo, and they packed the goods and received the money for them. As regarded the word "Dangerous," he (Mr. Nicholson) submitted that that was a relative term, depending on circumstances; and if he showed that the goods were securely packed, and would not under ordinary circumstances explode or leak, he thought he should be entitled to ask that this case should not be further pressed.

A man named Richards, in the service of Messrs. Davy and Mackmurdo, proved that he packed the goods in question in wooden boxes, filling up the vacant spaces with straw, so that the vessels containing the liquid could not move about. He added, on cross-examination, that he had sometimes packed apothecary wares in sawdust, in tin cases, which were afterwards soldered down.

Martin Luther Hayward, superintendent to Davy and Mackmurdo, deposed that he inspected the packing of the cases in question, and that the jar which had been broken was properly secured by straw from moving about and coming in contact with the others.

Mr. Robert Warington, chemical operator to the Society of Apothecaries, said he had constant opportunities of noticing how apothecary goods were packed for shipping on the society's premises. He was about to describe how they had long packed and shipped such goods for the East India Company, but the question was objected to and not pressed. He considered the articles in question were properly packed. They sent thousands of pounds of sweet spirits of nitre abroad from Apothecaries' Hall, and the cases containing them were always marked "Glass, with care," and described "Apothecary wares" in the shipping declaration. But packages of that kind were knocked about in the most careless way on the wharves. The goods under consideration were, in his opinion, properly packed, and the jar could only have been broken by some external violence.

Cross-examined.—The case in question might have gone to Singapore safe enough in a ship's hold, with ordinary care. He admitted that nitric ether there, in case of leakage, would become dangerous. He agreed with what Dr. Letheby had said as to the explosive and inflammable character of the ether. That, however, would depend in degree on the strength of the material.

Mr Charles Davy, head of the firm of Davy, Mackmurdo, and Co., manufacturing chemists, 100, Upper Thames Street, deposed that he executed the order for Mr. Stewart, and that the usual care was taken in packing and shipping the goods. He did not see the particular case packed in which the jar had been broken. In sending bottles abroad the size was invariably marked upon them, with the view to ascertain if there was any leakage; and before being shipped the bottles were allowed to remain a given time to test whether they leaked. He added that he had put about half an inch of spirits of nitre into a gallipot in his counting-house, and then applied two or three matches to it one after another—first of all at the top, then a little lower down, then brought it within about half an inch of the spirit; lastly, he put a match into the spirit, and then it ignited, but not until then.

Mr. John Wyman, of 122, Fore Street, export druggist, gave evidence to show that he shipped considerable quantities of drugs, and that he would have packed the goods in question in a similar way to that of Davy and Mackmurdo.

The *Lord Mayor*, at the conclusion of the investigation, said it appeared to him beyond doubt that the section of the Merchant Shipping Act, under which this

complaint was preferred, had been violated. The evidence of Dr. Letheby fully sustained that opinion, showing as it did the very dangerous and inflammable nature of the chemical compounds which had formed the subject-matter of this inquiry. It was fearful, indeed, to imagine the terrible consequences which might have ensued from the explosive and inflammable character of the contents of the packages in question. He felt, without wishing to exaggerate the case, that the statute had been clearly infringed, and that being so he was bound to inflict a penalty on the defendant. He was induced, however, to believe, from the highly respectable character of the company, that their object in instituting this proceeding was not to put the law in motion in its highest rigour with regard to penalty, but that it might operate as a warning to others dealing with the shipment of such inflammable materials. He hoped that the publicity which would be given to the inquiry would secure the end which the complainants had in view; and, under the circumstances, he should call upon the defendant to pay a fine—not of £100, which he was empowered to inflict—but of £10, believing that that would meet the justice of the case and satisfy the company.

Mr. Tindal Atkinson said the Lord Mayor had correctly appreciated the motives of his clients, and under the circumstances they were not disposed to apply for costs.

The defendant paid the fine, and with that the matter terminated.

ALLEGED ILLEGAL SALE OF ARSENIC.

At the Court House, Wakefield (before Colonel Smyth, M.P., chairman, and Captain Egremont), James Billinton, Chemist and Druggist, Westgate, appeared to answer two informations charging him with the illegal sale of arsenic on the 20th of September. The first information charged the defendant with selling the compound to a person under the age required by the Act; and the second with neglecting to colour it with either indigo or soot. Mr. McDonnold preferred the charge, and Mr. Gill defended.

It was proved in evidence, that on the 20th Sept. a woman named Charlotte Armitage died. An inquest was held on the body on the following day, and evidence was given before the coroner of certain matter taken by herself prior to death, and the jury returned a verdict that the deceased died from the effects of arsenic.

Mary Musgrove, domestic servant at the Swan with Two Necks, was examined by Mr. McDonnold, and stated that she was sent by Mrs. Armitage to Mr. Billinton's for two pennyworth of arsenic. In answer to the question, "What did you ask for?" witness said, "For two pennyworth of mercury;" adding, that it was white, and was weighed by Mr. Billinton, who wrapped it in paper, and labelled it "Poison." It was proved by the mother of witness that the age of her daughter was fifteen years in August last.

Mr. Gill said that, on referring to the Act of Parliament, the 14 and 15 Vic., c. 13, it would be seen "that as the unrestricted sale of arsenic facilitates the commission of crime," &c.; but this being a highly penal offence, he would not admit that arsenic had been sold. The little girl, Mary Musgrove, had distinctly stated that she asked for mercury, and he would not admit that arsenic and mercury were convertible terms. He took an objection to the information, on the ground that mercury did not come within the meaning of the section of the Act under which it was laid.

The Chairman.—There is no doubt but that, strictly speaking, mercury is no more arsenic than salt is arsenic, neither is it an arsenical compound.

Mr. Gill.—The term used in the Act is arsenic.

Mr. McDonnold.—It is well known that among poor people the terms arsenic and mercury are synonymous.

The Bench expressed the opinion that they could not convict in this instance, because the Act clearly named the term "arsenic," and in order to obtain a conviction they must prove that arsenic or an arsenical compound was sold.

The second information, charging the defendant with retailing arsenic without being coloured, was then proceeded with.

The sale was the same as that on which the first charge was preferred.

Mr. Gill stated that under the first section the case was dismissed, as it was not proved that his client had sold arsenic; and under the second information, there was no evidence to prove that the Act of Parliament had not been complied with.

The Bench, in giving their decision, expressed their approbation of Mr. McDonnold's conduct in bringing the case before them, but they thought it would have been better, in such an important case, to have had legal assistance. The first information was dismissed because the evidence tended to show that it was mercury and not arsenic that was sold; and the second must be dismissed, because no evidence had been produced to show that the material sold was not coloured.

BOOKS RECEIVED.

A Manual of Botany; *including the Structure, Functions, Classification, Properties, and Uses of Plants.* By Robert Bentley, F.L.S., M.R.C.S.E. Part I. Structural and Systematic Botany.

This is a worthy member of Mr. Churchill's series of manuals, and, for the pharmaceutical student especially, a valuable addition to the previously existing works on the subject to which it relates, forming, as it does, a complete text-book of the Botanical lectures delivered in our school. The part just issued constitutes, we believe, the greater portion of the work, and comprises upwards of 700 pages. The subjects treated of are well arranged, concisely yet explicitly described, and copiously and very beautifully illustrated. There are upwards of 1200 illustrations by Bagg, which are executed in the very best style of wood engraving. In the part relating to Systematic Botany, or the classification of plants, we observe that much matter is introduced which gives a pharmaceutical character to the book. This consists of brief notices of plants and their products, which are employed in medicine and for other technical purposes. We have no doubt this work will take its place among the best and most popular of those designed for the instruction of botanical students.

The Technologist: *a Monthly Record of Science applied to Art and Manufacture.* Edited by P. L. Simmonds, F.S.S. In 8vo, 32 pages. Price 6*d.* Kent & Co., Paternoster Row. Nos. 1 & 2. (From the Author.)

This Journal is well calculated to supply a want in our periodical literature. The author is well known as a most persevering collector and writer on the various substances used in the arts and manufactures, and to those of our readers who feel an interest in Technology, or Industrial Science, we cordially recommend this Journal.

Hints for the Cure of Consumption. By J. Kellie, M.R.C.S., late Presidency Surgeon, Madras, and President of the Madras Medical College. London: Richardson Brothers, 23, Cornhill. 1860. (From the Author.)

L'Union Pharmaceutique, *Journal de la Pharmacie Centrale de France.* Nos. 1 to 9, inclusive. Paris: Administration à la Pharmacie Centrale de France, 7, Rue de Jouy, 1860.

Disinfection and Hygiene. By Henry Bollmann Condy. London: G. P. Waterhouse, 275, Strand.

TO CORRESPONDENTS.

The Patent Medicine Licence.—A correspondent complains of the inequality of the Patent Medicine Licence, and states that there are some druggists in the country

making a large return from the sale of Patent Medicines, yet paying an annual licence of only 5*s.*, while those in town pay eight times the amount.

[We presume that the scale of charge, which is £2 for the metropolis, 10*s.* for corporate towns, and 5*s.* for other places, was adopted with a view of obviating the inequality complained of, but we admit that it fails to fulfil the object intended.]

Birmingham Pharmaceutical Institution.—A meeting was held in the Theatre of the Midland Institute, on Friday evening, October 26th, having for its object the revival of the above Institution. A report of the proceedings will appear in our next number.

M. B. (Gravesend) wishes for a formula for *Cold Cream Soap.*

A Dublin Apothecary should apply to the maker, Mr. H. B. Condy, Chemical Works, Battersea.

Experimentalist (Worcester).—We know of nothing that would effect the object desired.

T. W. G. (Wakefield) is thanked for his communication.

A. P. S. (London).—(1.) The evaporation should be slowly conducted, in order to obtain large crystals.—(2.) *Glycyrrhizin* may be obtained by slowly evaporating to a small bulk a strong solution of liquorice-root, and adding sulphuric acid; the precipitate which falls is then washed with water acidulated by sulphuric acid, then with pure water, and afterwards digested with alcohol. The solution is neutralized by the addition of a solution of carbonate of potassa, and then filtered and evaporated, when the glycyrrhizin remains in the form of a yellow transparent mass.—(3.) Mr. W. A. Lloyd, Portland Road, Regent's Park.—(4.) The sp. gr. should be 1.6, not 16.0.—(5.) Yes.—(6.) Messrs. Simpson, Maule, and Co., Kennington Road, London.

M. P. S. (Worcester).—*Bisulphuret of Mercury.*

A Student (London).—(1.) Ainsworth's *Latin Dictionary.*—(2.) Tomes's *System of Dental Surgery.*

J. H. S. (Manchester).—*Pharmaceutical Latin Grammar*, 5*s.*

Ficus (Knaresborough).—(1.) Any elementary work on the subject.—(2.) Yes.—(3.) Suitable for a beginner.

W. R. (Manchester).—The two specimens are certainly not compatible.

F. F. (Glasgow).—(1.) Vulcanized india-rubber.—(2.) We are not acquainted with the composition of the varnish referred to.

A. P. S. (London).—*Storm-Glass*, vol. i., 2nd series, page 487. Dissolve the salts in the water required to form the proof spirit.

W. C. (Grantham).—The process referred to is the best.

A Reader (Nottingham).—Distillation in the case alluded to would be illegal.

T. D.—(1). We are not acquainted with the article called Dix's black lead.—(2.) The bronze powder referred to is a mixture of metals in fine powder.

Galvani.—Bird's *Electricity and Galvanism*, 5*s.* 6*d.*

Erratum.—In the Advertisement of Tungstate of Soda in our last number, the price should have been 1*s.* 9*d.* per pound, instead of 19*s.*

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, Elias Bremridge, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. Churchill, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.
SECOND SERIES.
VOL. III.—No. VI.—DECEMBER 1st, 1860.

A DRUGGIST'S SUNDRY THOUGHTS.

BY MR. JOSEPH INCE.

(Concluded from page 252.)

Were I, under the present phase and circumstance of things, to superintend the training of an incipient Pharmaceutist, I should teach him as the crow flies; that is, I should arrange his daily studies with direct reference to his future prospects. There should be nothing in his whole curriculum useless, extraneous, or sentimental; nothing not absolutely in keeping with the recognized notion of a business man. To carry out this design more fully, I should proceed as follows:—I should withdraw my protégé from the teaching and influence of Professor Redwood, and from all other dangerous revolutionists of the same class; I should confiscate Fownes' *Manual* and Pereira's *Elements,* together with books of fanciful and romantic character; and having thus fairly cleared the course, I should store his mind with price lists, make him great in last quotations from the market, give him a thorough knowledge of Morganic Chemistry, and steep his intellect in Druggists' Sundries. But as a mere theoretical instruction is not of itself sufficient, I should add two years' apprenticeship by way of practice; during this period, should a spare evening hour present itself, he might learn a little Pharmacy, in homœopathic doses; and then, being familiar with the ordinary routine of business, I should consider his education perfect—should give him my blessing and a coloured lamp, and leave him to brave the world. Start not: I have just sketched the actual preparation of too many of our modern Pharmaceutists, excepting only the duration of the apprenticeship. Now I ask any Chemist who has accepted only the trade side of his profession, what result does he anticipate? On what does he build his hopes? What are the ultimate chances of success? I must frankly own that the probabilities seem to me so slight, and the range so limited, that I cannot in these cases understand the origin of the choice of Pharmacy as a means of living.

Let us not linger over ideal speculations; let us seek honestly to discover the value to be attached to the popular belief that Science does not pay, but that Druggists' Sundries do; and I think it will not be difficult to show the fatal error of forgetting that Pharmacy is so constituted that its trade and its science must stand or fall together.

Ten years back, in the first blush of the English fame of Liebig, we ran headlong into science; steam was to do everything, extracts were made in vacuo, pills were rolled out on scientific principles, mixtures had their compositions and decompositions, and daily shop requisites had their chemical affinities gravely, if not satisfactorily, defined. We caught the tail-end of this mania in an elaborate discussion how to concentrate our infusions, and an equally animated controversy on the merits and demerits of prepared lard. Meanwhile we were favoured with new remedies of obvious combination, nearly all chemical and mostly lilliputian; happy the metal not disguised as a tannate, or offered to a generous public under a name that the vulgar could pronounce; for nothing was more remarkable than that the smaller the compound the more elaborate its name; Chemistry surely never went to greater lengths. Time, the great leveller, has calmed the fever, the only traces of which remaining are those rows of diminutive nostrums in the cupboard, over which the anxious Pharmaceutist sometimes sighs. These are but the trivial accidents of a natural but mistaken wish unduly to exalt science, but I must tread cautiously while I advance further into this subject. Need I demonstrate how a man enamoured of science for its own sake, whose only thoughts are bent on elucidating some new theory, on

exploring, unravelling, and mastering fact, in order to deduce well ordered inference; whose fancy wings itself with resistless and encouraged flight into those pure regions where alone is truth, where thought dwells with knowledge; need I say how antagonistic must that man's feelings be to trade, or how lamentably he must fail if he attempt to meddle with that which he neither understands nor loves. Shall we therefore neglect science because it may be carried to an extreme? Shall we ignore it altogether because it may possibly become a dangerous fascination, or shall we not rather welcome it to our homes, and ask it like a good fairy to protect the hearth?

Listen to a simple story. William Yarrell was born in Duke Street, St. James's, where his father and uncle carried on in partnership the business of newspaper agents. When he was about eighteen, he became a clerk in the banking-house of Messrs. Herries, Farquhar, and Co., but he soon left that employ to join his cousin in the business which had previously belonged to their two fathers, and which, at the death of his cousin, became wholly his own. In the house in Duke Street, and in the corner house of Bury Street and Little Ryder Street, to which the business had for many years been removed, he passed the entire remainder of his life. Consider the position for a moment—a small corner shop, a back street, and to fold, wrap up, and despatch the daily papers. This placid mediocrity of surrounding circumstances is the worst anodyne of genius. Give a man a good difficulty to surmount, and he has at least the stimulus that necessity supplies; but where there is no mountain, there is generally little climbing. Had Yarrell simply attended to his honourable routine of business, he would in a certain sense have fulfilled the duties of his station, and his friends might have wept over the loss of an honest tradesman; but, wise in his generation, he dragged into a prosaic calling the astonished aid of Natural History. Yarrell liked two things—the rod and gun. With the first he was a cunning angler, and with the second an excellent shot. These two instruments proved undoubtedly his guide to the study of fishes and birds, more elegantly described in the summary of the Linnean Society as the "finny and feathered tribes." In 1817 he became a member of the Royal Institution, and divided his attention between Chemistry and Natural History, but he soon relinquished the former, and gave himself wholly to the pursuit of the latter. "For several years," says his memorialist, Mr. Bennett, "he contented himself with the patient and laborious collection of the large body of facts, which he ultimately turned to so good an account, and it was not until 1825, when he was upwards of forty years of age, that he published his first paper, 'On the Occurrence of some rare British Birds.' How the newspapers must have stared at home! Yet all this while they were not neglected. They were regularly folded, wrapped up, and forwarded as usual. He now was made one of the editors of the *Zoological Journal*, directly afterwards he was elected a Fellow of the Linnean Society, and in 1827 communicated to the members his "Observations on the Tracheæ of Birds, with Descriptions and Representations of several not hitherto figured."

These papers were the advanced guard of that long series of memoirs which appeared from time to time in the *Linnean Transactions*, *Proceedings and Journal*, in the *Transactions and Proceedings of the Zoological Society*, in the *Reports of the British Association*, in the *Annals and Magazine of Natural History*, in the *Philosophical Magazine*, in the *Entomological Magazine*, and in the *Zoologist*. No wonder that he soon attracted a large circle of scientific friends. "His quiet unpretending manners" (I again quote Mr. Bennett), "his varied information, his plain method of stating facts, and the clear precision of his inferences, the straightforward simplicity of his character, and his unvarying command of temper, rendered him on all occasions a most valuable adviser; and when all these traits in his character had become fully known, it was only with reluctance, and in accordance with established rules and regulations, that his name was ever omitted from the Council-lists of either the Linnean or the Zoological Societies." Space must limit panegyric. Yarrell

during many laborious years had made a considerable collection of British birds and their eggs, which he daily continued to increase. These collections served as the basis of his two great works, *A History of British Fishes* and *A History of British Birds*, being the detailed results of long observation both by sea and land, as well as of his unwearied researches in the closet. These wonderful examples of persevering industry form, and will long continue, the text-books of British naturalists in their own department. Of the popularity of these two histories no better proof could be adduced than the testimony of Mr. Van Voorst, the writer's friend and publisher, who states that Yarrell received on account of them no less a sum than £4000. It is not permitted in a public Journal to trench carelessly upon domestic matters, yet I think I may be allowed to state (especially as it is the grand point under consideration) that Yarrell's sedulous and undeviating attention to the routine of his business occupations was crowned with the desired success, and that, though at his death his multifarious papers amounted to no fewer than seventy, the establishment which he so well directed would have won the approbation of the most exacting manager. But what is fame? Whilst engaged in finding materials for the present sketch, I was temporarily damped by the following stricture :—"I don't see much remarkable in Yarrell; he did nothing but sell newspapers and write a book about fishes." Now I think that very remarkable.

Here, from a least expected source, we have the problem practically worked out, that Science and Business are not natural enemies. We may accept the evidence with greater faith, as it is the witness given by a most impartial experimentalist who was led to adopt the creed, neither from necessity nor from the natural suggestions of his daily duties; and yet there are a vast army of people called Pharmaceutists, with a definite branch of science ready to be their faithful servant, who, not in rash haste, but from cautious and prudential motives, turn the poor servant out of doors to seek an asylum in some of those large establishments which are supposed able to afford the luxury.

Am I to adduce instances and summon facts to show that this favourite system does not pay? I answer that it is my firm conviction that there is no poorer reward offered to incessant toil than that scanty living which is wrung from one-sided trade Pharmacy. No giant business in London demands a larger, if indeed an equal expenditure of time; no other honourable occupation entails severer assiduity, or more scrupulous attention than an establishment, however limited, which has abandoned Pharmacy and sought refuge in Druggists' Sundries. I make no reflection on that class of mind which can discover a fit exercise for its development in the sale and exclusive study of that long list of multifarious miscellanies ranging between "Death to Flies" and "The best Artificial Mother," but the sorrowful experience of hundreds will bear ample witness that such a course, unaided, is a meagre and often a thankless way of raising money. It positively drives away custom, for people hesitate to resort, save on emergency, to those houses which have a reputation for everything under heaven but Pharmacy. Men purchase tea and coffee at the grocers', they patronise the butcher for their meat, they have a shrewd guess where to get their candles, the tailor sends them clothes, the shoemaker supplies their boots, and in the common run of things, the world is not unreasonable in expecting physic from a Pharmaceutist.

Let science guide and likewise throw the prestige of its reputation over trade, and the prospect brightens into light: let the Pharmaceutist first and foremost know and practise Pharmacy, nor rest content until he has raised it to its last point of excellence, and he will be master of the position; place him in the least likely neighbourhood and he will gain his public, and it then may safely be left to his own discretion as to how much or how little he is to be further aided by the sale of Druggists' Sundries.

31, *Southampton Street, Covent Garden.*

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, *7th November*, 1860,

Present—Messrs. Bird, Bottle, Brady, Bucklee, Davenport, Deane, Hanbury, Haselden, Hills, Lescher, Meggeson, Morson, Sandford, Squire, and Waugh, the following were elected

MEMBERS.

BRIDGENORTH .....Deighton, Thomas Milner
KILMARNOCK .....Smith, James Taylor
LONDON .....Baldock, John Henry

MAJOR EXAMINATION, *20th November.*

Bourdas, Isaiah.....London

MINOR EXAMINATION.

Brown, William Henry .....North Shields
Chessall, Rowland.....Hoxton
Colby, John .....Brighton
Jackson, Warwick.....Colchester
Olliver, George Edward .....Weymouth
Savage, William Wallace.....Brighton
Welborne, George .....Grantham

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS.
Burlingham, Frederic.....	Mr. Johnson	Birmingham
Lacey, Richard.....	Mr. Arnold.....	Norwich
Saul, William Wingate.....	Mr. Prior	Oxford

PHARMACEUTICAL MEETING.

Wednesday, November 7th, 1860.

MR. T. N. R. MORSON, PRESIDENT, IN THE CHAIR.

THE following

DONATIONS TO THE LIBRARY AND MUSEUM

were announced:—

Journal of the Chemical Society. From the Society.
Journal of the Society of Arts. From the Society.
The Photographic Journal. From the Society.
Transactions of the Linnean Society. From the Society.
British Journal of Dental Science. From the Publisher.
The Technologist. From the Editor.
The Chemical News. From the Editor.
The Chemist and Druggist. From the Editor.
Journal of the Botanical Society of France. From the Society.
Proceedings of the Royal Institution of Great Britain. From the Institution.
A specimen of Clove Bark (*Dicypellium caryophyllatum*). From Mr. Hogg.
Oil of Loodianah Grass. From Mr. Hills.
Improved syphon nipple shield and valved infants' bottle. From Messrs. Morgan, Brothers.

The specimen of Loodianah oil was accompanied by a drawing of the grass from which it was extracted, and a note from Mr. J. G. Perry, in which he

states that it was extracted by Dr. Baddeley, of the Indian service, while residing in India in 1836, but the method of extraction was not described.

Some discussion took place with reference to the mode of extracting this, and other similar oils.

Mr. Deane had been informed that Indian grass oils were prepared by boiling the grass with a small quantity of water, when the oil separated and was removed from the surface of the water.

Mr. Simmonds said there was much confusion as to the sources and modes of preparation of these oils, of which there were several met with in commerce, and he thought it very desirable that correct information should be obtained with reference to them.

The Chairman thought it doubtful that the oil before the meeting could be obtained by merely boiling the grass with water.

The following papers were read:—

ON THE RELATIVE VALUES OF SOCOTRINE AND BARBADOES ALOES.

BY MR. RICHARD W. GILES.

The therapeutic importance of aloes may be inferred from the circumstance that there is no purgative pill in our present Pharmacopœia into the composition of which it does not enter. It constituted more than 50 per cent. of the compound extract of colocynth P. L. 1836, and is besides a chief ingredient in the pill popularly known to the humbler classes as "Pil. Cocciæ." In any other form than that of a pill it might have been supposed that its extremely nauseous taste would have prevented its administration, yet we find the compound decoction is in great demand both as a pharmacopœial preparation and as an old-fashioned domestic medicine, with many modifications, under the name of "*Baume de Vie.*"

In the Pharmacopœia of 1851 (for the first time, I believe), Barbadoes aloes finds a place, but its employment is only directed in one instance—Pil Aloës c. Sapone,—on account of which it is probable that it was exclusively introduced. It would seem to be by inadvertence that it is permitted *sub silentio* in the Enema Aloës. The inquiry to which I desire to direct the attention of the Society is, whether the comparative value of the two descriptions of aloes, viz. Barbadoes and Socotrine (including Hepatic), is fairly represented by the positions they respectively occupy in our Pharmacopœia. In my opinion it is *not* fairly represented, but, on the contrary, so far as my observation goes, the Barbadoes is a better description of aloes for medical purposes, acting in a preferable manner as a purgative to the Socotrine. This opinion has been held by some medical practitioners, including apparently the late Dr. Marshall Hall, from whose original and favourite formula known as Pil. Aloës Diluta our Pharmacopœia has borrowed the directions for the preparation already spoken of under the name of Pil. Aloës c. Sapone.

It is well known that many patients have a strong objection to the use of ordinary aloes, and we must all have noticed the solicitude manifested by such persons to have their prescriptions dispensed with the veritable aqueous extract instead of the crude drug. Now it is worthy of remark that the per-centage of aqueous extract in Socotrine aloes is about 56, and in Barbadoes about 80; and it almost follows that if the aqueous extract is really preferable in its operation, according to the concurrent belief of the faculty and their patients, *that* description of aloes must be the best which contains the largest proportion of aqueous extract.

But in addition to this, Messrs. Smith of Edinburgh by their discovery of aloine, seem to me to have supplied a further *à priori* argument in favour of

Barbadoes aloes. From their experiments (*Ph. Journal*, vol. xi., p. 23) it appears that aloine is at all events obtained with greater facility from Barbadoes aloes than from any other description; and although the contradictory statements which have been published with reference to this substance are somewhat perplexing, we may safely conclude that the purgative properties of aloes are due to it in part, if not wholly, and that the facility with which it is obtained from the Barbadoes variety, indicates its abundant presence in a condition unaltered by the process of inspissation, which cannot be said with equal confidence of Socotrine aloes. (*Vide* Dr. Pereira's paper on Aloe Juice, *Ph. Journal*, xi., 439.)

The favourable estimate of Barbadoes aloes, deducible from its relation both to the aqueous extract and to aloine as above described, has been confirmed by my own experience, for after arriving at the conclusion that the Barbadoes was medicinally the best kind, I began by substituting it for Socotrine in the compound rhubarb pill prepared for retail purposes, and since that time have so constantly heard that the pills thus made are preferred to others, that it is impossible to resist the conviction that there is a very marked superiority in the action of Barbadoes as compared with Socotrine aloes. More recently I have carried the substitution a step further, by employing the aqueous extract instead of the crude aloes; but, although I am still inclined to recommend this second change, as rendering the improvement more complete, I cannot say that it has produced equally marked results, and I am only more strongly convinced that the advantages which have been stated are special attributes of the Barbadoes variety of aloes.

I will only add to these remarks an extract from Pereira's *Materia Medica* bearing on the subject. Comparing the varieties of aloes, he says, "Socotrine aloes has long been regarded as the best kind of aloes, though its commercial value is now below that of Barbadoes. It is, I suspect, inferior in activity." (Per., *Mat. Med.*, 3rd edition, vol. ii., p. 1077.)

In his lectures Dr. Pereira used to tell his class that Russian castor, though comparatively worthless, was sold for £2 per ounce, while the American, rich in resin, fetched but 20*s.* per pound. This may teach us that a traditional preference sometimes attaches to an article less abundant in the market, though intrinsically less valuable; and I have some suspicion that this applies to the varieties of aloes.

Clifton.

Mr. Simmonds thought the difference in the different sorts of commercial aloes was due, in some degree at least, to differences with regard to the cultivation of the plants. The plants yielding Barbadoes aloes were cultivated, while those yielding Socotrine aloes were not cultivated. He remarked on the large quantities of Cape aloes recently imported, the quantity being now double what it used to be. The imports of aloes for the years from 1853 to 1858 were as follows:—

	lbs.
1853	246,575
1854	357,579
1855	573,404
1856	542,330
1857	562,948
1858	594,683

Mr. Bentley said the preference usually given to Socotrine over Barbadoes aloes was, he believed, principally due to the more agreeable action of the former. As far as he could judge, the purgative effects of all the different sorts were nearly alike, especially those of Socotrine and Barbadoes. Some of the latter sort of aloes

recently introduced was remarkably good, and seemed to indicate that much care was now devoted to its preparation. With regard to aloine, it did not seem to be very well established how far the action of aloes was dependent upon that body.

Mr. Deane did not think the action of aloes could depend on the aloine contained in it, as aloes from which no aloine could be obtained was found not to be deficient in activity. He found that aloes rich in aloine would yield none after being exposed to the action of heat. This was the case with the aloes juice which was imported some years ago, and of which a notice was given at the time by Dr. Pereira.

Mr. Brady thought Hepatic superior to Socotrine aloes, which was probably due to the former having been less heated during its preparation. He referred to the formula of the Pharmacopœia for *Pilula Aloes cum sapone*, which is the representative of Dr. Marshall Hall's *Pilula Aloes diluta*, and thought the authors of the Pharmacopœia had mistaken the intention of the originator of the formula by ordering extract of Barbadoes aloes instead of the aloes itself.

Mr. Deane had found in the preparation of *Pilula Aloes cum sapone*, that a much more homogenous and a better mass was produced by the addition of a few drops of *Liquor Potassæ*, which neutralized the acid of the treacle, and prevented this from decomposing the soap.

A Member stated that he had found the application of heat to the pill mass to yield a satisfactory result without the use of the alkali.

The Chairman said the whole subject of aloes was one of considerable interest and importance to Pharmaceutists, and deserved more attention than it had hitherto received. Much certainly had been written on the subject, and some experiments had been made, both in this country and abroad, but the chemical history of aloes was yet but very little known. A thorough investigation of all that related to this substance was much wanted, and he should like to see it undertaken by some member of the Society who had the time and means at his command for doing it effectively. The conditions under which aloine was obtained from the different varieties of aloes were not generally understood, and there were points connected with the preparation and use of that substance which required explanation. Aloine appeared to be most abundantly and most easily obtained from Barbadoes aloes, but the question arose, was aloine the active principle of aloes? Some writers disputed the fact even of aloine possessing purgative properties, while others entertained a different opinion. He should like to see the chemical history of aloes proposed by the Society as a subject for a prize essay.

ACETUM IPECACUANHÆ.

BY MR. GEORGE JOHNSON.

Some time ago I was anxious to find some cheap menstruum for the active principle of ipecacuanha, *i. e.* emetina; and on reading the article relating to that substance in Pereira's *Materia Medica*, I found that emetina is easily and entirely soluble in acetic acid.

I at once thought, why here is the very thing I want; and accordingly tried the experiment of making an acetic solution of the root, which I did in the following manner:—

Two and a half ounces of ipecacuanha were finely bruised, and allowed to macerate for twelve hours in five fluid ounces of acetic acid. Thirty-five ounces of water were then added, and the maceration continued for twenty-four hours longer, with frequent shaking. The solution was then filtered, and the residuum strongly pressed. The resulting solution is of a rich brown colour, very similar to well-made ipecacuanha wine, and when tested, either chemically or medicinally, is nearly double the strength of that preparation.

Being carefully neutralized with ammonia, and treated with a few drops of tincture of galls, a precipitate of tannate of emetina is produced, much larger in amount than that from an equal quantity of ipecacuanha wine similarly treated. I have supplied two medical friends with a portion of the preparation, and they report very favourably as to its effects, both as an expectorant and emetic. One of them administered fifteen drops to one of his own children, about one year and a half old, and it produced instantaneous vomiting; and in another child of five years old the same quantity produced nausea and retching.

This preparation has several important advantages over the ipecacuanha wine, among which I suggest the following:—

1st. It is cheaper, not being half the price of the old preparation, and if introduced into the Pharmacopœia it would be a boon to medical men who dispense their own medicines, and particularly to the medical officers of hospitals and dispensaries, who, from motives of economy, frequently use tartar emetic as an expectorant, when, if there was any cheap preparation of ipecacuanha, they would gladly and frequently substitute it.

2nd. This preparation could be made of a uniform strength, and might always be depended on, whilst the wine, containing a variable per-centage of alcohol, will vary in a like proportion in the quantity of active matter dissolved.

3rd. The *acetum ipecacuanhæ* will keep for a long time without undergoing decomposition or depositing a sediment. Ipecacuanha wine, however well prepared, or however bright it may be when recently made, soon becomes cloudy, and deposits a dirty sediment. This most probably represents a portion of its active matter, and, if so, every month it is kept its efficacy must be diminishing. Add to this fact the one just before alluded to—viz. the possible original deficiency of alcohol in the wine employed—and, however charitably disposed we may be, we can hardly avoid the conclusion, that much of the ipecacuanha wine dispensed is not of much therapeutical value.

These advantages of the *acetum* over the *vinum ipecacuanhæ* have appeared to me so great as to entitle the former to a place in the Pharmacopœia; hence my present communication. I hope the subject may be viewed in the same light by the Pharmacopœia Committee, and that they will lay it before the Committee of the College; for if the latter should decide to adopt the preparation, I should have the happiness of feeling that I had done a little, though *but* little, for the advancement of Pharmacy.

Aston Road, Birmingham.

The Chairman thought the suggestion made by the author of this paper a very good one. It was probable that all the activity of ipecacuanha root would be very readily extracted by the acetic acid.

Mr. Deane concurred with the statement just made. No doubt the acidity of the wine used in making *vinum ipecacuanhæ* contributed in making that preparation more active, for it was probable that some of the emetina existed in the root in an imperfectly soluble state, combined with tannic acid.

A Member said he had been accustomed to prepare a tincture of ipecacuanha, using proof spirit instead of wine, and he found the preparation active and uniform in its effects.

Mr. Brady thought that even water was a sufficiently good solvent of the active matter of ipecacuanha root, as was sufficiently proved by the efficacy of syrup of ipecacuanha, which was a popular remedy in some districts. The sugar in this preparation prevented any decomposition from taking place.

A paper "On the Medicinal Uses of Glycerine" was deferred until the next meeting.

PHARMACEUTICAL MEETING, EDINBURGH.

A MEETING of the Society was held in George Street Hall, on Wednesday evening, 31st October, at nine o'clock,

MR. J. R. YOUNG, PRESIDENT, IN THE CHAIR.

There was a good attendance, and the following introductory remarks were made by the Chairman:—

THE PRESIDENT'S ADDRESS.

On taking the chair for the first time as the President of this Society in Scotland, I have first of all to return thanks to my brethren for the very high honour which has been done me. When I call to remembrance those gentlemen who have formerly filled this chair, all of whom, without exception, have long held, and, I am happy to say, still continue to hold a high position, not only as intelligent and successful Pharmaceutists, but also as respected and distinguished citizens, I feel all the more grateful for the kindness shown me. With this feeling, however, there clings a deep sense of my own unworthiness and unfitness aright to discharge its duties, but the consciousness that every assistance will be given by the Council and by our unwearied and invaluable Secretary, and that your indulgence will not be withheld either now or on subsequent opportunities, gives such assurance as impels me forward in the hope and confidence that our meetings during this session may not yield to those that are past, either as regards the interest taken in them or the value of the information which may be contained in the papers with which the Society may be from time to time favoured. Since our last meeting in the month of April, we have been dependent altogether for any information connected with the Society on our monthly Journal, and from its pages we have evidence in abundance of its growing vigour and prosperity in the south. A paragraph in the May number intimates that "the preliminary arrangements for constructing a laboratory on the top of the premises in Bloomsbury Square were completed, and a tender for the work accepted;" and in the September number we are told that "the laboratories are nearly finished, and are in extent, and with regard to the completeness of the arrangements, unequalled in this country." This surely is matter of congratulation and encouragement even to us and others who, though living at too great a distance to draw immediate advantages from the varied sources of instruction which will be given at these laboratories, have yet the consolation of knowing that through the vigorous exertions and admirable management of those who have guided the affairs of the Society—a body of individuals who twenty years ago were scattered, disunited, all but overlooked and nameless, and without the shelter of a roof to shield them from the storms without, have now from united action and steady perseverance not only a name, but also a modicum of fame, and, in addition, a princely mansion, wherein to rally in time of need, and containing within its walls an educational establishment consisting of library, museum, lecture-rooms, and suite of laboratories second to none in the kingdom. This surely augurs well for the future prosperity of the Society, and leaves little doubt that the steps which have been adopted for increasing the facilities for teaching will have a powerful influence on any future legislation in connexion with our profession. This circumstance has induced me to believe that the present is a suitable time for endeavouring to impress on the minds of those of our brethren north of the Tweed who are not yet members of the Society to lose no time in having themselves connected with it. At its institution, and again at a subsequent period, all were urgently invited to enrol themselves in its ranks, and the invitations were so general and so pressing that none had any one but himself to blame if he failed to take advantage of either opportunity. But from the circumstance I believe that a great many of our Scotch druggists having had more or less of a medical education, many of them, indeed, holding medical diplomas, the Society has not hitherto been so successful in obtaining members in Scotland as it ought. It is true that none carrying on business can now become a member of the Society without an examination and the payment of a considerable sum in money, and although it may at first sight appear a hardship to these gentlemen that they should be called on to undergo examination, a little reflection will enable them to perceive that the previous opportunities having been neglected or overlooked, the Society is now compelled by Act of Parliament to abide by its own

laws and regulations in reference to admission. Individually I have an opinion, and I know I am not singular in holding it, that if it was at all possible to devise means by which, instead of members being called on to make immediate payment of the sum they are now required to do on entering, it could be taken up in annual instalments, the Society would add to its numbers very materially, but whether such a change can be brought about or not, it is very obvious that, at the present time, we stand as it were on the threshold of a new era for the chemists and druggists of these kingdoms. The day is possibly not far distant when the Legislature will demand from every chemist a test of education and scientific knowledge. This appears all the more probable from the change which has taken place during the past years in the laws regulating medical schools, and in the much higher standard of education now required of those studying for the medical profession, and, as was well said by the late lamented Professor G. Wilson, in his admirable address to us at the commencement of our last session, "You cannot now go back, you have committed yourselves to the nation to go forward; even if you wished to halt, the medical profession would compel you to advance or to leave the field altogether." It would be foolish to speak in language other than kindness to our tardy friends, but it must be very apparent that this Society having from the first taken high ground as an educating body, it is from very necessity compelled to keep abreast with the ever advancing tide of knowledge. The chances, therefore, are, that the apparent difficulties connected with entering the Society now will, as time rolls on, become not only more formidable in appearance, but also much more so in reality. Let me then say in the language of Holy Writ to all who have any desire to see their profession raised to that position which it occupies in continental countries, "Come let us build together."

Not very many years ago there were few indeed styling themselves chemists and druggists who, however well able they might be to buy and sell the articles in which they traded, yet gave themselves any concern with the history, action, or uses of their medicaments. It is pleasing now to know that there are those in the ranks of this Society capable of conducting the most delicate chemical analysis, or drawing offhand a diagram showing the actions and results of one body upon another, and not only so, but who can describe with accuracy and minuteness the botanical characteristics or the actions and uses of any known medicine. I had the pleasure during the summer of making the acquaintance of a gentleman who presently holds a position in St. Bartholomew's Hospital, and whose recent papers on carmine, and on the spontaneous oxidation of oils, must be familiar to the readers of our Journal, and in course of conversation I felt exceedingly gratified to learn that it was at the Bloomsbury School he had got his first lessons in chemistry. I thought at the moment, Well, now here is a branch, a living branch, a branch from which already has there sprung some ripe and golden fruit, and I resolved that on the first opportunity which presented itself I should make a point of pressing publicly what I have often done privately, viz. the propriety of making such arrangements with our apprentices as that they at least shall all become connected with the Society. They are all willing; their friends, so far as my experience has gone, are never unwilling when the matter is explained to them, and it therefore rests in great measure with employers whether this natural inlet is taken advantage of or not. I feel satisfied that from this source our great supply must come, and I cannot use language strong enough in trying to persuade members not to neglect it. It is true that some of these apprentices in consequence acquire a taste for study and branch off to the higher professions, others again find their way to the south, or it may be a home in other lands; but though these may be losses that the Society has to mourn over, yet their connexion with it, I feel assured, has not been without its benefit. I would press especially on our assistants, many of whom are every year coming up from the country, the advantages that must ultimately accrue to them from such a connexion. The monthly Journal to which, from the time of entering, every apprentice, associate, and member is entitled, forms a bond of union by which all are made early aware of anything of importance connected with the business. The evening meetings during the session afford opportunities for friendly intercourse, and tend to break the monotony of daily toil; and the library now tolerably stored with volumes full of interest and instruction cannot fail to prove attractive to all who are desirous of improvement, and with such improvement in early youth, combined with ordinary activity, self-denial, self-con-

trol, perseverance, and moral worth, there is little fear that any love-sick Romeo will have to say of such:—

"I do remember an Apothecary,
And here about he dwells, whom late I noted
In tattered weeds, with overwhelming brows,
Culling of simples; meagre were his looks;
Sharp misery had worn him to the bones;
And in his needy shop a tortoise hung,
An alligator stuffed, and other skins
Of ill-shaped things; and about his shelves
A beggarly account of empty boxes,
Green earthen pots, bladders, and musty seeds,
Remnants of pack-thread, and old cakes of roses,
Were thinly scattered to make up a show.
Noting this penury, to myself I said,
And if a man did need a poison now,
Whose sale is present death in Mantua,
Here lies a caitiff wretch would sell it him."

Thereafter Dr. Macadam delivered the following lecture, and illustrated the subject by several beautiful and interesting experiments:—

THE CHEMICAL BIOGRAPHY OF A PLANT,

With special reference to those Vegetable Products which are employed in Pharmacy.

BY DR. STEVENSON MACADAM.

The subject of lecture this evening is the Chemical Biography of a Plant, and will discuss the principal points known regarding the chemistry of plant life. My duty will be to show you that, in a chemical sense, a plant is a far more wonderful thing than an animal, and that, in the endless chain of the circulation of matter, the plant forms an important and indispensable link. In a chemical point of view, the earth can be conceived as existing for a time tenanted by plants only, and utterly devoid of animals, but we never can picture to ourselves this globe as the abode of animals unaccompanied by plants. The animal is indebted to the plant for everything which it requires for its bodily existence. The plant gives out pure air for the animal to breathe; it stores up food in the grass and the seed for the animal to live on; and it directly manufactures cotton and linen for the animal to be clothed with. Indirectly, the plant even lends a helping hand to the carnivorous animal, for, though the latter does not eat grass, yet it devours the animal which fed on grass, and gets at second hand, in the mutton or beef, the nutritive particles which were originally made by the grass plant on which the sheep or the ox fed. And in clothing, too, the plant indirectly supplies the silk, the wool, and the furs which the man-animal clothes himself with, for the animals which directly hand us these, obtained the raw material to fabricate them from the plant matter they partook of.

In a utilitarian point of view, there is great similarity in the grouping of the two great kingdoms of nature, the plant and the animal. In both we have (1) *food members*, in the cereals, potatoes, turnips, &c., on the one hand, and in roast beef, mutton, venison, &c., on the other; (2) *clothing members*, in linen, cotton, &c., and in wool, silk, fur, leather, &c.; (3) *locomotive members*, in wood, coals (fossil wood), employed as engine-feeders, and in the horse; and (4) *useless* (?) *members*, in weeds on the one hand, and vermin on the other.

The various species of plants known to botanists number about 120,000. The inquiry into the origin of the existing vegetation must always partake of the nature of speculation, but much is known. The latest geological epoch may be regarded as the date of the present races of plants and animals. The question as to whether there was a plant or a seed first, is analogous to the query whether a chick or an egg was first created, and is a point which has been discussed in halls of science, but which we need not care about stopping to consider. Each plant appears to have a centre of development where it is more extensively present than at other parts, and this gives rise, in part, to a particular flora being characteristic of each country.

It is a question how far these centres of development are evidences of there having been a single original plant, or several plants of the same variety, originally sown broadcast at those parts where they now flourish. So far as the introduction of plants on the surface of the earth is concerned, geology can tell us much. Plants, like animals, have tenanted this world in several different series; and there has been a birth and death of the series, and a similar introduction and termination of the individual plant. The history of science in later times does not reveal the disappearance of any plant, though in the animal kingdom one member has passed away in the dodo. So early as the year 160, a skilful botanist made a catalogue of the plants in a forest near Copenhagen, and, on comparing the list with the plants now growing there, no member is wanting. In the ruins of Pompeii and Herculaneum representations of plants are found which are the same as those found growing there at the present day. But these instances do not afford positive evidence that no plant has disappeared in later times, like the dodo among animals; for plants are not so well known as animals, and members of the vegetable kingdom may have become deceased without being taken note of.

Plants and animals agree in possessing organised structures, but in their chemical constituents they do not differ from the inorganic or mineral kingdom; though, in the building up of their structures, vital force comes into play, and makes the same elementary ingredients appear very different. It is more difficult to distinguish between plants and animals than between inorganic matter and organic structures. The sponge and, more lately, the microscopic diatomaceæ, which swarm in stagnant water, were for long the ground of contention between naturalists and botanists, the former calling them animals, and ultimately carrying off the sponge in triumph, whilst the botanist named them plants, and finally absorbed the diatomaceæ into his domains. Even colour forms no sure point of distinction. *Red* is generally associated with the animal kingdom, and *green* with the vegetable; but there is the *red* snow plant growing in the Arctic regions, and a *green* composite animal called the volvox.

Vegetable and animal tissues originate in a cell. The lower members of each kingdom are mere cells, whilst the higher are multiples of these cells, at times transformed and altered in shape. The rapidity of the growth of cells may be observed in a large fungus of the puff-ball tribe, which, in a single night, will grow from a mere point up to a huge gourd, producing cells at the rate of 4,000,000,000 in an hour, or 66,000,000 in a minute. The algæ, lichens, fungi, and mosses, are simply cellular, whilst ferns and flowering plants contain many cells, especially in the pith. In the leaf of the carnation, in a cubic inch there are some 3,000,000 of cells.

When a seed is placed in the ground, and undergoes the process of germination, it becomes remodelled, at first, like a piece of putty, it is not added to, except in absorbing heat, air, and moisture, but gradually minute roots with their spongioles are thrust down, and a pigmy stem with its leaves springs up. As yet the seed has been expending the stock in trade which its parent handed to it, but now, having exhausted its store in forming roots and stems, the plant must seek new material from external sources.

Dr. Macadam then referred in detail to the aërial and saline food of plants, and explained the composition of the bases, gases, and earthy substances which the plant employs as the raw material from which to fabricate the multitudinous articles of food, medicine, and clothing, which the plant provides for the use of the animals. He then specially referred to the theory of the production of the various groups of organic compounds of vegetable origin, including the organic acids, starch, and the alkaloids.

A vote of thanks was proposed by Mr. Robertson to Dr. Stevenson Macadam for the admirable lecture he had given, which was carried unanimously and with acclamation.

Intimation having been made regarding the winter arrangements for the Library, the meeting adjourned.

PROVINCIAL TRANSACTIONS.

LIVERPOOL CHEMISTS' ASSOCIATION.

Second Meeting of the Fourth Session, Oct. 25, 1860,

THE PRESIDENT, DR. EDWARDS, IN THE CHAIR.

The following gentlemen were elected Members of the Association :—Messrs. James Price, jun., Alfred Dale, Henry Osborne, Thomas Trevitt, John Simpson, — Wearing. The following were elected Associates :—Messrs. R. H. Wearing, — Edwardson.

The Secretary announced donations to the Library : — The *Pharmaceutical Journal*, from the Pharmaceutical Society ; and the *Chemist and Druggist*, from the Proprietor. Mr. H. S. Fisher exhibited some beautiful bouquets of flowers and ferns, dried and mounted on paper. Mr. Stephens exhibited and explained a small but powerful magnifier, constructed out of a pill box, with a drop of Canada balsam for a lens.

Mr. T. Sherlock then read the paper of the evening, "On the Manufacture of Artificial Manures." After some remarks on the same subject by the President and other Members, the proceedings were closed by a vote of thanks to the lecturer.

Third Meeting, Nov. 8, 1860,

THE PRESIDENT IN THE CHAIR.

The following gentlemen were elected Members :—Messrs. Wm. Gossage, Wm. Livesey, Frederick Watson, Robert Thomas, Joseph Martin, Samuel Drew, Joseph Moir,

The Secretary announced the following donations :—To the Library, the *Pharmaceutical Journal*, from the Pharmaceutical Society; two copies of a paper on Magnetic Light, from the author, Dr. Edwards ; Withering's *British Botany*, in four vols., from Mr. H. S. Evans. To the Museum, specimens of Vittie-Vayr, or Cuscus Root, and of Soap Nuts or Berries, the fruit of *Sapindus Saponaria*, from Mr. H. S. Evans; Root of Bryonia dioica, or Black Bryony, from Mr. H. S. Fisher. Sixteen volumes lately purchased for the Library were placed on the table.

The Secretary read a letter from Mr. Charles Jones, on the poisonous nature of the fruit of the potato plant, and its watery extract, detailing the results of some experiments.

An anonymous communication was also read from a Member, under the signature of "Gunpowder," recommending the formation of a rifle corps in connexion with the Association, but the suggestion did not appear to be approved by the meeting.

Mr. J. Whitworth then read an address to Mr. H. S. Fisher, from the members of the Botanical Class, and on their behalf presented Mr. Fisher with a Microscope, in recognition of his kindness in taking charge of the class during the past few months.

Mr. Fisher feelingly replied, acknowledging their kindness, thanking them for their handsome present, and expressing his readiness, on the return of spring, to assist, as far as lay in his power, those Members and Associates who wished to pursue the interesting study of Botany.

The President having vacated the chair (to which Mr. H. S. Evans was unanimously voted), proceeded to deliver a lecture on "Magnetic Light." The lecture was of a highly interesting character, and was illustrated by a large number of brilliant experiments, which elicited the warm and repeated applause of the meeting. At the close of the lecture, a hearty vote of thanks was accorded to Dr. Edwards, and also to the donors of books and specimens.

Fourth Meeting, Nov. 22, 1860.

THE PRESIDENT IN THE CHAIR.

Mr. Wm. Aylward was elected a Member of the Association.

The Secretary announced the following donations to the Library:—*The Chemist*

and Druggist, from the Proprietor; *Proceedings of the Liverpool Architectural and Archæological Society* for the eleventh session, from the Society. To the Museum:—A quantity of Crystals taken from an old flue at the Widnes Dock Alkali Works, from Mr. Wm. Whitthread; Leaves of the *Erythroxylon Coca*, of Peru, from Mr. H. Bird.

The SECRETARY read some remarks which had appeared in the *Daily Post*, on the extensive use of this drug by the natives of Peru and other parts of South America as a stimulant narcotic. An infusion of the leaves, handed round the room, tasted something like strong tea of poor quality.

The CHAIRMAN informed the meeting that it had been decided by the Council to hold a Conversazione on the evening of the 20th of December, and the Secretary will be happy to hear from any Members or friends who have objects of interest which they may wish to exhibit on the occasion.

Mr. JOSEPH OUTRAM then read the paper of the evening, "On Chemical Combinations." After which the PRESIDENT made a few remarks on the results of Professor Bunsen's experiments in detecting the presence of various metals by optical means, alluding particularly to the almost constant presence of lithium in mineral waters.

After the usual vote of thanks to the lecturer and donors the meeting separated.

ORIGINAL AND EXTRACTED ARTICLES.

FACTS AND FALLACIES CONNECTED WITH THE RESEARCH FOR ARSENIC AND ANTIMONY; WITH SUGGESTIONS FOR A METHOD OF SEPARATING THESE POISONS FROM ORGANIC MATTER.

BY ALFRED S. TAYLOR, M.D., F.R.S.

(*Continued from page* 270.)

ARSENIC AS AN IMPURITY IN COPPER.

IT has been hitherto considered that one of the great advantages of Reinsch's process was that, while hydrochloric acid might easily be obtained pure, no question could arise about the impurity of copper. The presence of arsenic in the purer forms of this metal was, until 1859, either not suspected or wholly ignored by chemists of the highest authority. It now turns out that there is no kind of copper available for use which is free from arsenic; and some kinds of foil and wire hitherto used, and still employed by analysts of repute, contain arsenic united to copper as arsenide in comparatively large proportion. As this question is of considerable importance, not only in reference to the present, but the future employment of this useful process in judicial investigations: and, from causes which I need not here enter into, it has not hitherto received that calm attention which it merits, I shall endeavour to lay before the reader the facts which I have ascertained regarding the presence and influence of this impurity in a medico-legal analysis.

In turning to Reinsch's original report of his discovery, it will be found that, while he enforces attention to the purity of the *acid* employed, he merely directs that the *copper* should, previously to use, be cleaned with nitric acid, washed in water, and rubbed dry with filtering-paper. These are all the precautions given by the discoverer in reference to the selection of the copper. In fact, upon his plan, any copper might be used, provided it had a clean surface. The test which he employed to determine the purity of his materials was that which has been in use among toxicologists up to the present day, namely, before introducing the suspected substance, to boil a piece of clean copper with the diluted hydrochloric acid for four or five minutes; and if it did not acquire any tarnish or deposit, the copper and acid were to be regarded as sufficiently pure for the detection of the poison. Undoubtedly a negative result of this kind would be

a proof either of the entire absence of arsenic from the metal itself, or, if present, that it was so intimately combined with the substance of the copper as not practically to affect the application of the process in a medico-legal analysis. Resting upon this simple datum, Reinsch says of his method, "Elle ne peut donner lieu à aucune méprise."* Dr. Christison, who has employed it during a period of fifteen years for detecting arsenic in the liver, says in his last edition on Poisons,† that "copper-leaf or copper-plate, worn thin by the action of diluted nitric acid, or *fine copper gauze*, is the best form for use. . . . . In all medico-legal inquiries it is necessary to perform a preliminary experiment with distilled water and the hydrochloric acid used, *lest the acid contain arsenic*. . . . It (the process) is not subject to any fallacy." If any additional authority is required to show how little toxicologists of great repute and enlarged experience suspected that arsenic was lurking in the copper which they were so frequently using, or that there was any better method of testing the purity of the materials than that originally devised by Reinsch, it is furnished to us in the extensive experience of Mr. Herapath, of Bristol. In an article already referred to, this gentleman thus describes his mode of operating.‡

"I take pieces of copper wire about No. 13 size, and two and a half inches long; these I hammer on a polished plane for half their length, and having brought the suspected matters to a state of dryness, and boiled the *copper blade* in the pure hydrochloric acid, to prove that *it* (the acid) contains no metal capable of depositing, I introduce a portion of suspected matter, and continue the boiling," &c. If there is a deposit, it is removed by scraping, and tested. Referring to the fallacious results which occasionally arise from accidental causes, Mr. Herapath further says: "As much of the sulphuric acid of commerce, and nearly all such hydrochloric acid, and some commercial zinc, contains arsenic, nothing can excuse a toxicologist who attempts to try for arsenic if he has not previously experimented with *all* his reagents before he introduces the suspected matters."§

It is reasonable to suppose that when this paragraph was written Mr. Herapath had no suspicion that copper wire known as No. 13 contained arsenic, or, indeed, that in employing or recommending it for Reinsch's process, there was any necessity for testing it for arsenic. He gives explicit directions for testing the acids and zinc for arsenic, but no suggestion for testing the copper. In short, Mr. Herapath, so far as the copper is concerned, adopts no other method of preliminary examination for arsenic than that propounded by Reinsch in 1841, which has been used by all toxicologists since that date. This, it is well known, consists in boiling the polished or clean copper with the diluted acid before adding any portion of the suspected poisonous material. Having procured from three of the first London chemical dealers three samples of the wire No. 13 size, as recommended and used by Mr. Herapath, I found in each sample a *larger proportion of arsenic* than that which existed in the copper-gauze used by Dr. Odling and myself in the Smethurst case.‖

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* 'Annales d'Hygiène," 1 843, p. 452.

† "Treatise on Poisons," fourth edition, 1845, p. 272.

‡ Ure's "Dictionary of Arts," Part i., 1859, p. 191.

§ Loc. cit.

‖ This case drew from Mr. Herapath, in the capacity of "amicus justitiæ," a letter, which was published in the "Lancet" of September 3rd, 1859, and in most of the medical and daily journals. It condemned in strong language the use of copper containing arsenic, and suggested that all convictions which had for twenty years taken place upon the use of Reinsch's process could be only regarded as judicial murders. Let the reader consider the value of such a condemnation coming from a man who, unfortunately for his appeal to justice, had himself during sixteen years employed and recommended for Reinsch's process a strongly arsenicated copper-wire! It will be perceived, by his mode of operating, too, that not satisfied with depositing

Men who should have a better knowledge of the subject, asserted that there was no novelty in the announcement of this universal presence of arsenic in the so-called purest forms of copper. The untruthfulness of this statement can only be appreciated by those who have taken pains to refer to the highest chemical authorities. It was known that arsenic was associated with the ores of copper; but there was a general belief, from the known volatility of arsenic (at 380°), and the repeated meltings which copper underwent in the process of refining (being each time heated to 196°), that the whole of this arsenic was evolved; and that if it anywhere existed, it would be only in the coarse kinds of unrefined or commercial copper. Berzelius ("Traité de Chimie," tome iii., p. 124), in an elaborate description of the properties of this metal and the mode of extracting it, makes no reference whatever to even the possible presence of arsenic as a contaminating ingredient in copper. Dumas, in his "Traité de Chimie appliquée aux Arts" (tome iii., page 472 *et seq.*), in giving a complete history of this metal, speaks of its being contaminated with lead and antimony, but he does not mention arsenic as an impurity. Among other works of great chemical authority may be enumerated those of Despret's, "Elémens de Chimie," i., 428; "Ure's Dictionary," art. "Copper;" Mitscherlich, "Lehrbuch der Chemie," ii., 187; Graham's "Elements of Chemistry," p. 579; Turner's "Elements of Chemistry," edited by Liebig and Gregory, 1847, p. 509; "Elements of Chemistry," by Sir Robert Kane, 1849, p. 552; Brande's "Manual of Chemistry," 1848, i., p. 820; Regnault, "Cours Elémentaire de

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arsenic on the impure copper, he directs that the deposit should be continually scraped off as it is formed, thus mixing the impure copper with the supposed arsenical deposit. In this letter, Mr. Herapath states that the *one thousandth* part of a grain of arsenic is quite sufficient, by Reinsch's process, to furnish the five proofs which he requires for scientific evidence on a charge of murder. A few grains of his No. 13 wire will, under certain conditions, yield this quantity of arsenic, which, in ignorance of its presence as impurity, an analyst might easily assign to the liquid or solid examined. Measured by his own standard, and quoting his own words, "what shall be said of the convictions and executions which have taken place during sixteen years upon Mr. Herapath's evidence, if the same impure copper has been used by him in the process of Reinsch?"

Either Mr. Herapath knew that the No. 13 wire, which he employed and recommended, contained arsenic, or he did not. If he did know it, then he deceived the public and profession by the publication of his letter; if he did not know it, then, instead of acting as censor of others, he should have acknowledged with penitence his own chemical transgressions for the long period of sixteen years, and have thanked those who, for the first time, in 1859, pointed out to him the danger of the course which he was pursuing. If danger ever arises from the presence of impurities in chemicals, that danger is undoubtedly incurred in the highest degree when a man is rashly prepared to swear to the presence of poison from the discovery of the *thousandth part of a grain!* Of Mr. Herapath's conduct and motives in this transaction, I shall only say, "Quem deus vult perdere prius dementat."

I cannot close this note without, for the sake of contrast, noticing the candid and honourable conduct of an excellent chemist, and eminent practitioner, Dr. Douglas Maclagan, of Edinburgh, in reference to the discovery of this impurity in copper. Before the fact of the general presence of arsenic in copper had been made publicly known by the evidence given by Dr. Odling and myself at the trial of Smethurst in August, 1859, Dr. Maclagan had conducted a series of analyses for arsenic by Reinsch's process in a criminal case in Scotland, and had arrived at the conclusion that arsenic was present in the fluids and solids of the body. This case came to trial at Inverness, some months subsequently to the trial of Smethurst. After giving his evidence, and confirming his previous report, Dr. Maclagan requested the permission of the Court to correct it, by stating that by reason of certain matters which had become public since his first analyses, he had been induced to examine the copper which he had employed in his experiments, and he found it to contain arsenic. The proportion, however, was much smaller than that which he had extracted from the liver and other organs of the deceased. He had previously tested it in the manner in which, up to that time, it had been customary to test it, namely, by boiling it in diluted hydrochloric acid, but he had not until then looked for arsenic in its substance. This statement, showing the candour and honesty of the witness, was well received by the Court, and it did not subject this gentleman to that unlimited abuse which, on this side of the Tweed, it appears customary, among a certain class of barristers, to shower upon scientific witnesses.

Chimie," 1851, tome iii., p. 271; Gmelin's "Handbook of Chemistry," 1851, vol. v., p. 401; Abel and Bloxam's "Handbook of Chemistry," 1854, p. 409; Pereira's "Elements of Materia Medica," 1854, vol. i., p. 867. In these works of authority there is no reference to even the occasional or possible contamination of refined or any other kind of copper with arsenic; and two of the authors last mentioned, who are among the most recent writers on the science, state distinctly that "the best specimens of commercial copper are nearly pure; they contain only traces of iron." (Abel and Bloxam, op. cit., p. 409.) Dr. Miller, in his "Elements of Chemistry," 1856, part ii., p. 980, does not speak of the contamination of refined copper by arsenic; but in reference to commercial copper, he states that it is very nearly pure; it contains minute quantities of arsenic, iron, and lead. It is worthy of notice, that among the above-mentioned chemical authorities there are three (Mr. Brande, Dr. Miller, and Messrs. Abel and Bloxam) who especially describe Reinsch's process for detecting arsenic, and they concur in stating that the only test required for ascertaining the purity of the materials used, is first to boil the copper in diluted hydrochloric acid, in order to ascertain their purity before employing them as tests (Brande, p. 933; Miller, p. 967; Abel and Bloxam, p. 571). Messrs. Abel and Bloxam recommend the use of ordinary copper-wire cleaned with concentrated nitric acid and washed. I might add to these authorities the names of Orfila, Devergie, Schneder, Chevalier,* and other writers on toxicology, to prove either that the presence of arsenic in refined copper was entirely unknown as a chemical fact, or wholly ignored as an obstacle to the safe use of Reinsch's process for the detection of arsenic. Orfila, it is true, recommends, as a precaution, that the copper used should be heated in a tube, to ascertain whether it evolves arsenious acid, before boiling it with hydrochloric acid and the suspected substance. With this supposed precaution, which, it need hardly

* Among all the works in the English and French languages on the adulterations and impurities of substances employed in chemistry, medicine, and the arts, there is, perhaps, none which can compete in comprehensiveness with the "Dictionnaire des Altérations et Falsifications des Substances Alimentaires, Médicamenteuses, et Commerciales," by M. Chevalier, of which the third edition was published in 1857. It consists of two volumes, comprising nearly 1400 pages. M. Chevalier is much employed in Paris in medico-legal analyses. On referring to this work (tome i., pp. 19 and 51; tome ii., p. 672), it will be found that the author is especially careful to describe arsenic as an impurity in sulphuric and hydrochloric acids and in zinc; to explain the means for its detection and separation, and to caution analysts in reference to its presence in these substances; but he does not even refer to *copper*, although he has himself published papers on its application and use, in reference to Reinsch's process. The only inference to be drawn from this omission is, that he either was not aware of the existence of arsenic in copper, or that its presence exerted so little influence on the uses of this metal as to render it unnecessary to notice it as an impurity.

The fact that all the commercial and nearly all the medicinal *sulphate of copper* contains arsenic, is also unnoticed by this writer. At p. 467, tome ii., he merely refers to the presence of sulphates of iron and zinc in sulphate of copper. There is so much arsenic in the ordinary sulphate, that ten grains of the crystals will commonly yield clear evidence of its presence. Other writers of repute on Materia Medica have, like M. Chevalier, overlooked this fact. Thus Pereira ("Materia Medica," i., p. 872) describes traces of sulphate of iron as the only impurity. The presence of this arsenical impurity may have an important bearing on evidence. If a man has taken large doses of sulphate of copper as an emetic and dies, arsenic may be found in the contents of his stomach, although none may have been administered. Chemists relying upon thousandths of grains may thus be deceived, and mislead a Court of law by their evidence. It is not a little remarkable that those who have condemned the use of copper containing arsenic, have either ignorantly or knowingly employed the sulphate of copper as a test for arsenic, without having previously tested this test for the poison itself. It is true that the quantity of arsenic present is small, and is not likely to affect the results, as the test is ordinarily used; but it is clear, if metallic copper is condemned because it contains traces of arsenic, no salt of copper can escape condemnation for a similar reason. It is the presence of a large quantity of arsenic in the commercial sulphate which is the cause of the occasional deposition of arsenic with copper by electrolysis.

be said, is not, chemically speaking, sufficient to distinguish arsenical from non-arsenical copper, he relied upon the production of the metallic deposit as a perfectly safe and certain indication of the presence of arsenic in the substance examined.* Flandin, who was opposed to the use of any process for detecting arsenic excepting his own, objected to Reinsch's method, not on the ground of arsenic being possibly conveyed to the liquid by copper, but because it was less delicate than the process of carbonization by sulphuric acid.† Galtier, in his "Traité de Toxicologie" 1855, i., p. 343, describes Reinsch's process, and merely requires that the copper should be *clean* and the diluted acid pure. Devergie speaks of it as a process but little employed, and simply points out that *clean copper* is required for the deposition of the arsenic.‡

In fact, whether among English or French and German writers on chemistry and toxicology, there is not one who has ever pointed out, or even suspected, that this process would lead to error by reason of the universal presence of arsenic in copper, commercial or refined, which is accessible to the chemist.§ All have hitherto relied upon the cleanness of the surface of the copper used, and the method of testing the acid and copper first pointed out by Reinsch. As a general rule, this is quite sufficient. There is no liability to fallacy unless the copper is used on a large scale, and there is an acid or salt present which acts upon and dissolves the impure metal. Pending its solution, the atoms of arsenic, combined with it as arsenide or arseniuret, are set free, and may thus attach themselves to the clean surface of the undissolved copper. It is clear that if the presence of a minute quantity of arsenic in copper presents that great risk of fallacy, which some chemists have recently endeavoured to impress on the public mind, no one of the numerous analyses for arsenic by Reinsch's process, which have been undertaken during the last twenty years, could have been made without the inevitable discovery of arsenic. In short, if a source of fallacy, it would have led to the constant and inevitable discovery of arsenic in every solid and liquid submitted to examination. Analysts who have had much experience in the use of this process, will bear me out in the statement, that in employing samples of the same copper and acid,—for one affirmative result in which arsenic is discovered, there will probably be four or five negative results, in which no deposit whatever has taken place on the arsenical copper, and no arsenic was detected. By boiling successive quantities of the same arsenicated copper in the same acid liquid containing arsenic, the whole of the free arsenic is finally removed; the deposits on the metal become less and less decided, they at length cease altogether, and the last portion of copper put into the liquid comes out nearly as bright as when introduced, or if at all dull on the surface, this dulness arises, not from arsenic, but from oxidation, as a result of long boiling. It is obvious, that if the arsenic came from the copper itself, and not from any extraneous source, instead of the

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* "Traité de Toxicologie," fifth edition, 1852, tome i., p. 521.

† "Traité des Poisons," i., 625, 1846.

‡ "Médecine Légale," Paris, 1852, tome iii., p. 460.

§ That wisdom which is almost invariably manifested after an event was shown soon after the trial of Smethurst, in comments upon the chemical evidence. It was suggested by one chemist that the copper-*gauze* which Dr. Odling and I had been in the habit of using for some years in the lectures on Chemistry and the demonstrations on Practical Chemistry at Guy's Hospital was of an arsenical nature, while copper-*foil* or *wire* either was or might be easily obtained free from arsenic; that every chemist knew there was arsenic in copper, and that no one but ourselves had employed Reinsch's process without first dissolving a portion of the copper in an acid or in chlorine, and testing the salt thus produced for arsenic. It was forced upon the attention of the Court that one of the chemists for the defence had always taken especial care to use electrotype copper, as if this fact was a guarantee against its containing any arsenic. (See p. 318.) In short, whatever may have been the motive animating these critics, their statements, as will be seen from the authorities quoted, displayed either great ignorance or great untruthfulness.

arsenic diminishing on each introduction of the copper, it would go on increasing in proportion to the quantity of the metal employed in the analysis. The hundreds of negative results which have been obtained by experienced analysts, establish the untruthfulness of the assertion, that the process, as it is commonly employed, is attended with a serious risk of fallacy, even when copper containing arsenic is unknowingly used. The analyses performed by Reinsch, Gaultier de Claubry, Orfila, Christison, Maclagan, Geoghegan, Watson, Penny, and others, are as unassailable on this ground as those which have been performed by Mr. Herapath himself, even with his No. 13 commercial wire, *i.e.* assuming that the copper and acid have been boiled together, and no deposit formed before the suspected substance was added.

There is, however, great danger in endeavouring to conceal or distort a scientific truth, especially when, as experience now shows, reliance is placed upon false criteria to determine the presence or absence of arsenic in any given sample of copper. In the letter already referred to, Mr. Herapath states that the hundredth part of a grain of arsenic contained in the quantity of copper gauze (ten grains) used by Dr. Odling and myself in one of the analyses in Smethurst's case, would have rendered it (the copper) so *brittle*, that it could not be drawn into wire at all, much less into fine wire fit for gauze. The copper-wire (woven in gauze) which led to this fallacious result was not more than 1-200th of an inch in diameter, and probably even less. The gauze included about 10,000 spaces or apertures in the square inch. We had the benefit of the opinion of an experienced chemist (Mr. Brande) as to the quantity of arsenic separated from the gauze in this experiment; it was considered to be equivalent to a proportion of at least 1-1000th part of arsenic. It caused some surprise to Mr. Brande, as well as to ourselves, that so much arsenic, in a well-defined ring of octahedral crystals, should have been procured from such highly flexible and refined copper as that which we employed in our experiment. It was a new fact to him and to ourselves, that copper in so highly ductile and flexible a condition should be so strongly impregnated with arsenic. It is clear from Mr. Herapath's reliance on exceeding brittleness as a test of the presence of a small quantity of arsenic in copper, that he would have drawn the same inference which, in the first instance, we felt constrained to draw, namely, that no arsenic could be contained in a wire so fine and flexible as that which we used. Other authorities share Mr. Herapath's erroneous opinion in reference to this matter. Gmelin says, on the combination of arsenic with copper,* that "copper alloyed with 0.15 per cent. of arsenic, becomes somewhat brittle when cold, and very brittle at a red heat. Regnault states, that copper containing arsenic in small quantity becomes whitish and very brittle; and Abel and Bloxam say, that a very small quantity of arsenic injures the colour of the metal, rendering it whitish, at the same time causing it to be somewhat brittle. Nothing can be more unsafe then a reliance upon these alleged physical effects of arsenic on copper, as evidence of the presence or absence of that substance. The facts now ascertained are simply the reverse. Copper may contain sufficient arsenic to lead to fallacious results in analysis, without any change of colour, and without losing any of its malleability or ductility; while, when entirely deprived of arsenic and other metals, it has been found so brittle that, even after several meltings and annealings, it was impossible to roll it into thin foil.† From some experiments recently made by Dr. Holzmann and Dr.

* "Handbook of Chemistry," tome v., p. 470.

† I sent a sample of copper without arsenic to my friend Mr. Brande, for the purpose of having it rolled under the Mint presses. He writes to me, that "there is an inherent *hardness* and *brittleness* about it which we have in vain attempted by repeated fusions, &c., to get rid of, so that it has ultimately produced a riband full of flaws and fissures."

Matthieson on the conductivity of copper, it would appear that the electric conductive power of ductile copper is materially affected by the presence of small quantities of arsenic, as well as of other metals and metalloids. An analysis of the black precipitate formed during the electrolytic decomposition of sulphate of copper by the galvanic current, has led to the discovery of twelve metals, which must have been contained in the original copper. One hundred parts of this black sediment yielded 7.40 parts of arsenic. The other metals found in variable proportions were antimony (9.22 per cent.), platinum, gold, silver, lead, iron, nickel, cobalt, vanadium, and tin.* It now becomes, indeed, a serious question whether purity in regard to this and other metals is not merely a relative term; and whether the discovery of these metallic impurities does not depend on the quantity of copper or zinc submitted to analysis at any one time.

I am indebted to Dr. Matthieson, of Torrington Street, London, a skilled metallurgical chemist, for some useful facts regarding the effects of arsenic on copper. He informs me that there is no test so delicate or certain for the detection of this impurity in copper, as its power of conducting the electric current. While pure copper has a maximum power of conduction, the presence in it of the smallest traces of arsenic, &c., scarcely discoverable by chemical processes, reduces the conducting power to a measurable extent. He has given to me, 1st, a sample of copper containing 5.4 per cent. arsenic. Its colour is pale red, it has evidently undergone a change; but its ductility has been so little affected that it has been drawn into a wire only 1-80th of an inch in thickness. It is flexible, but breaks when suddenly bent. 2. A wire containing 2.8 per cent. of arsenic having a diameter of about the 1-100th of an inch. It has the usual copper-red colour, and can be bent and twisted upon itself without breaking. It manifests no more brittleness than ordinary copper-wire of the same thickness. Although it contains nearly 1-33rd of its weight of arsenic, no one, judging by its appearance and physical properties, would entertain a suspicion of the presence of this substance. 3. A third wire of Spanish copper containing 2 per cent. of arsenic. It has about the same diameter as No. 2. It is perfectly flexible, and manifests no brittleness whatever. 4. A sample of fine British copper-wire as it is commonly sold, with traces of arsenic. It is of about the same diameter, but is not so elastic as 2 and 3. Let the reader compare these facts with the following statement contained in Mr. Herapath's letter:†—"The hundredth part of a grain of arsenic in that quantity (ten grains) of copper, would render it so brittle that it *could not be drawn into wire at all*, much less into fine wire fit for gauze." It is obvious that this chemist is either entirely unacquainted with the properties of copper containing arsenic as an alloy, or that he relies upon the general ignorance of the public and profession in reference to such matters, to publish a statement wholly opposed to facts.

Having recently examined not fewer than forty samples of copper, as it is employed by chemists in the form of wire of various sizes, of foil of various thicknesses, and of gauze, coarse and fine, I have found arsenic in all of them, and in some instances in comparatively large proportion. These samples were procured from dealers in this metropolis, from various parts of England, from Scotland, and Ireland. Some of them have been forwarded to me by medical practitioners who had employed them as *pure* in medico-legal analyses, while some samples of gauze and foil had been sold as pure by dealers. In every instance arsenic was found in the copper; and there is no other conclusion to be drawn than

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* "Proceedings of the Royal Society," tome x., No. 38, 1860, p. 302.
† "Lancet," September 3, 1859, p. 248.

that all the copper used in commerce, the arts, and chemistry, refined or unrefined, contains arsenic in such proportion, as when the metal is dissolved or destroyed, to render it unfit for Reinsch's process.* Mr. Brande stated, in his evidence at the trial of Smethurst, that this was to him a new fact in science, and it was equally new to all who had the candour and honesty to avow it, and who were not ashamed to acknowledge that they had been in the habit of using copper without applying any other method of testing it before use than that which was originally suggested by Reinsch. On this occasion I procured from five gentlemen, of great repute in the three kingdoms as analysts in cases of poisoning, samples of the copper which they had been in the habit of employing in their analyses since the introduction of Reinsch's process. In each instance arsenic was detected in the copper, and in two of the samples the proportion was greater than in the copper gauze which had been employed in our analysis.

It was asserted on the part of the defence in Smethurst's case, that *electrotype* copper was always pure, and that this could easily be procured. In order to test the accuracy of this statement, I have, since the trial, made an examination of seven samples of electrotype copper, three of which were prepared by myself, one was prepared by a respectable London firm, and another sample was procured from Elkington's electro-plating factory, at Birmingham. Two others were given to me by friends. In five of these no arsenic was detected; in the sixth, a small quantity was found; and in that which, in richness of colour and flexibility, surpassed all the other samples—namely, Elkington's copper, known under the name of "copper edgings"—arsenic was detected in well-marked proportion. The purity of electrotype copper cannot, therefore, be taken for granted; every sample should be tested before it can be pronounced to be free from arsenic. The purity or impurity of the deposited copper no doubt depends on the purity of the sulphate employed, and the rapidity of deposit.† Mr. Dugald Campbell has furnished me with the results of his experience in the subjoined letter:—

"*Arsenic in Copper.*

"In compliance with your request, I now write to you the results of my examination of twenty samples of copper, which were all sold as *pure*, and in many instances were specially stated to be free from arsenic.

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* Since writing the above, I have met with a passage in Will's "Analyse Chimique," translated by Risler (1858), in which, in speaking of the diffusion of arsenic, he says, "On en rencontre des traces presque toujours dans le soufre, le fer, *le cuivre*, l'étain, et l'antimoine."

† The above-mentioned facts show how extensively arsenic is diffused. Our copper coinage contains a large proportion. I have detected arsenic in the copper coinage of all our sovereigns, from the present time to the reign of George II. I found it, but in smaller proportion, in a coin of the reign of Augustus Cæsar; and in a portion of brass from a sepulchral inscription of the reign of Henry V. (1416). All our copper culinary utensils contain it; and when these are corroded or destroyed by acids, salts, or fat, arsenic is set free. The arsenic is deposited with the insoluble copper salt, and may be detected in it. Thus, in the insoluble oxychloride of copper deposited as a result of the action of common salt on copper under exposure to air, I have found arsenic, but not in the liquid. Salt fish cooked and allowed to cool in a copper vessel, may thus become impregnated with arsenic. Brass contains a large proportion of arsenic, derived from the zinc as well as the copper. As brass nails and plates are frequently and profusely used for coffins, insoluble cupreous salts containing arsenic may be formed during the decay of the body, and become intermixed with the remains. This is a point which requires looking to when chemists rely upon thousandths of grains, and they are engaged in analyzing the remains of the dead after some years' interment. In an exhumation of a body after nearly two years' burial, at which I was present, I noticed, on the front of the dress covering the body, a large brass button, which had become incrusted with a blue deposit of hydrated oxide and carbonate of copper, heightened in colour by the ammonia of decomposition. I have no doubt that had this been tested it would have yielded arsenic. Nickel silver, containing half its weight of copper and about one-third of its weight of zinc, also contains arsenic. The native subchloride of copper, obtained from the Atacama desert in Peru, did not yield any trace of arsenic.

"Of these samples, eight were said to be *electrotype* copper; and, from their appearance, I should say they were. Four out of the eight were said to have come from Germany.

"Some of these samples I had from friends, and the remainder were purchased in London from different sources of high respectability.

"In every one of these samples I found the presence of arsenic, higher in some than in others, but unmistakable in all. I do not say that the arsenic was in such quantities as in ordinary circumstances to mislead an experienced person in detecting arsenic in a substance by Reinsch's test; still in fluids containing oxidizing acids, and when it was requisite to detect minute quantities of arsenic, I think the quantity of arsenic in even the purest of these eight coppers would interfere with the test.

"Of the remaining twelve samples, some were purchased in London from undoubted sources of respectability, others were obtained through friends at Bristol, Liverpool, Edinburgh, and Glasgow. Two out of the twelve were copper-gauze—the remaining ten were foil of different thicknesses.

"In all these samples of copper, arsenic was present in distinct quantity, and, as in the electrotype samples, there was a variability as to quantity; but the sample most free from arsenic contained much more than the most contaminated of the electrotype samples. I am of opinion that some of the samples were so impure from the presence of arsenic, as even to mislead an experienced person, when testing for this substance under ordinary circumstances.

"I remain, &c.,

"August 13th, 1860. "Dugald Campbell.

"Dr. A. S. Taylor."

If these facts be admitted, the inquiry naturally follows: Is there any risk in employing copper containing arsenic, for separating this substance in cases of poisoning? The answer may be anticipated. There is no risk, unless the copper, during the process, is brought to a state of solution; and of this fact the operator is immediately informed by the disappearance of the metal and by the liquid acquiring a deep green colour. Hence, while the negative results which the process so frequently furnishes, afford an unquestionable proof that the copper may be used with safety, the operator has clear evidence when there is risk, by the solution of the copper in the acid liquid. If the copper employed is unaltered in weight, and is not to any perceptible extent dissolved, it is obvious that the liquid submitted to analysis cannot have received any impregnation of arsenic from the copper employed; and if, under these circumstances, arsenic is deposited on the copper, then that poison must have been present in the liquid submitted to examination. Cold hydrochloric acid, if strong and not too freely exposed to air, produces no deposit or change in the appearance of bright copper, even after forty-eight hours' immersion and exposure. Whether the copper be pure or arsenicated, there is no perceptible difference. The upper stratum of the liquid has a slight greenish yellow tint, arising from the oxidation and solution of a small quantity of copper. If the polished copper is immersed in an acid diluted with eight parts of water, it will be found after forty-eight hours that the whole of the liquid has a greenish colour from the formation of chloride; the copper, if arsenicated, is coated with a thick dark-coloured deposit; while, if pure, it is of a reddish-brown colour. The surface of the metal in either case will be found much corroded, and a number of tetrahedral crystals of subchloride of copper are scattered over it. I have not been able to procure crystals of arsenious acid by heating impure copper thus coated, and I have not detected any arsenic in the acid liquid; the amount of arsenicated copper dissolved is probably too small to furnish any evidence of arsenic. These results confirm Reinsch's statement that the concentrated acid,

cæteris paribus, exerts a less powerful action on copper than the diluted acid; they also prove that arsenicated copper should not be allowed to remain for a long time in the acid liquid. The tarnish thus formed might, unless properly tested, be mistaken for arsenic, or conceal an arsenical deposit. They prove, however, that the alloy of arsenic and copper (arsenide) is not so decomposed by cold diluted hydrochloric acid, as to set free any arsenious acid in the liquid. In short, the danger of any fallacy in the ordinary use of the process arises from the presence of arsenic as an impurity in the acid, and not from arsenic contained as impurity in the copper. But for this fact, no chemist would ever have met with negative results in employing copper in the state in which it has hitherto been used.*

Hydrochloric acid, diluted with from six to ten parts of water, has but a feeble action on copper, even after long boiling. A trace of this metal may, under these circumstances, be found in the liquid. If, however, the oxide of arsenic or antimony should be present in the liquid, a portion of copper is immediately dissolved, and an equivalent portion of arsenic or antimony is deposited. So soon as the copper is completely coated, the solvent action is arrested. In order to determine how far arsenicated copper is liable to undergo solution, and to set free arsenic as a result of boiling in pure hydrochloric acid diluted, the following experiment was performed. A quantity of copper-foil and gauze, equivalent to 39.4 grains in weight, was boiled in a retort with a mixture of one ounce of pure hydrochloric acid, and eight ounces of water. The boiling was continued for half an hour, and the distilled acid liquid was collected in a cool receiver. This amounted to twelve fluid-drachms. It contained no trace of copper; and on a careful examination of the liquid by Marsh's and Reinsch's processes, there was not the slightest trace of arsenic in it. The large quantity of acid liquid left in the retort was found to contain a small quantity of copper; but there was no arsenic dissolved in it. The undissolved copper, when washed and examined by the microscope, had no metallic deposit upon it; it was unchanged in colour, but presented slight marks of corrosion. A quantity of it heated in a tube gave no sublimate.

When arsenicated copper is boiled in the diluted acid for five minutes—a period within which arsenic, if present, is commonly manifested by some deposit or change of colour on the surface of the metal—no copper is dissolved. The metal retains its usual polish and lustre. If a small portion of oxide of arsenic or antimony be now added to the boiling acid liquid, there is an immediate deposit on the clean copper surface; and copper, in small quantity, will be found dissolved in the liquid by that delicate test—ferrocyanide of potassium. It is, therefore, obvious that the metallic oxide (*i. e.* the poison itself) brings about the solution of the copper, but not to an extent to eliminate arsenic so as to affect the process. It has been alleged that the accidental presence of certain salts, or organic liquids not containing arsenic, would lead to a sufficient solution of the copper to give rise to a deposit of arsenic on that metal. This action has been loosely ascribed to alkaline nitrates, phosphates, sulphates, and chlorides—salts which may be occasionally met with in organic liquids. A grain of each of these salts was dissolved in two drachms of diluted hydrochloric acid, in the proportions used for the precipitation of arsenic (1 : 8). The solution was brought to the boiling point, and boiled for a few minutes in contact with a slip of polished copper. No copper was dissolved in any one instance,

* In the case of Smethurst, out of seventy-six analyses in which the process of Reinsch was resorted to, arsenic was detected in only two instances. In one of these, the copper was entirely dissolved by reason of the unexpected presence of chlorate of potash, and there was no doubt that, from subsequent investigation, the arsenic here detected proceeded from the dissolved copper. In the other instance the copper was *not* dissolved, but was coated in a few minutes, as is usual in cases in which arsenic is actually present as a poison.

and the metal retained its lustre. On adding a minute portion of arsenic to the liquid, the metallic copper was speedily coated, and traces of a salt of copper were now, for the first time, found in the liquid. When to a similar quantity of acid liquid, in which copper was immersed, a fragment of chlorate of potash was added, there was an immediate solution of a portion of the metal; a fact rendered evident by the production of a green colour, and by the application of the usual tests for copper to the liquid.

(*To be continued.*)

REMARKS ON THE NEW BELGIAN PHARMACOPŒIA.

BY MR. HENRY GROVES.

In bringing before the readers of the *Pharmaceutical Journal* a notice of the new Belgian Pharmacopœia, it will be as well, in the first place, to describe under what auspices, and with what amount of labour, this work came into existence. The date of its commencement is almost as old as the establishment of the kingdom. It appears that its predecessor was the Pharmacopœia of 1823, at which date Belgium formed a part of the kingdom of the Low Countries; but, separated from Holland, independent institutions were fostered, and one result is the subject of the present notice. The precise date of its commencement we are unable to fix, but it was a long time ago, for the preface informs us that it is of a date "*fort ancienne;*" however, this we know, that its preparation was entrusted to a commission of six, being an equal number of physicians and pharmaciens. This commission, from various causes, was broken up without much progress having been made with the work it had undertaken. A few years rolled on, and, with the establishment of the Academy of Medicine, another start was made; some twelve of its members, amongst whom was a veterinary surgeon, setting about the task left undone by their predecessors. What became of the bulk of this commission is not told, but, after a lapse of time, four of their number were authorized to put the finishing stroke to the work.

This occurred in 1853, but it was not until July of the present year, 1860, that it became authorized and enforced by law.

The Pharmacopœia is divided into several parts, of which not the least interesting is the introduction. Here we find comparative tables of the weights, thermometers, arëometers, &c., in use throughout Europe; lists of substances altered by light; densities of essential oils; posology; and other useful matters. Previous to the present publication the authorized weights had very nearly the same value as the troy now employed in England; the Belgian pound, from 20 to 30 grains heavier than ours, was divided into 12 ounces, of 8 drachms of 60 grains as with us. Now the decimal system has been adopted, and with it the French custom of weighing liquids as well as solids. The thermometer is centigrade; alcoholometer that of Gay-Lussac; and the arëometer that of the old Pharmacopœia, which is the same as Beaumé's as regards liquids more dense that water, while it differs by 10° in fluids of lesser density: that of Beaumé marking 10° at the zero of the Pharmaceutical one. After this part comes a variety of instructions grouped promiscuously, and very tender solicitude is shown towards the pharmacien by defining sizes of plasters, represented by such terms as playing-card, half-sheet of paper, large, small, a medium palm of hand, &c.; and even thighs, legs, and arms, have a given measurement, so that the prescriber is thus spared an unnecessary display of penmanship. Then there is a list of antidotes to be given in case of poisoning, only to be administered in the absence of medical aid, and also instructions (not very flattering to wholesale houses) that drugs are to be bought whole and powdered at home. Apropos of

the subject of wholesale houses, I may mention that my experience leads me to coincide with the caution exhibited by the medical commission, for drugs, taken as a whole, are very unsatisfactory in Belgium, nor is the mode of sending them out less so, for I have frequently seen five or six articles delivered without labels on any one of them. Imagine bicarbonate of potash of a buff colour and five or six distilled waters, supposed to be different, having precisely the same smell and taste, and you have an idea how some "good houses" carry on their affairs. We will now glance at the various preparations inserted in the Pharmacopœia, most of which occur in the codex proper, whilst some others are found in the appendix. It will be as well, however, before proceeding further, to make a few notes on the "selection and preservation of herbs." This is a branch of Pharmacy to which our continental brethren pay especial attention, and in which they are certainly very successful. The species of plants employed in domestic medicine necessarily varies in every district, but there are two or three in general use whose names are familiar as household words; such are the corymbs of different species of *Tilia*, known as *Têtes de tilleul;* and the rhizomes of *Triticum repens*, L., called *Chiendents*, besides which there is liquorice-root, &c. The following remarks in the Pharmacopœia are worthy of notice :—Parts of plants should be collected from wild, rarely from cultivated specimens, and foreign ones employed when such species are not thoroughly naturalized. *Annual roots* to be collected just at the commencement of flowering ; *biennial*, at the end of the first year of their growth at the beginning of winter; *perennial*, at the end of two or three years, generally in autumn. *Bulbs* principally in autumn, after the withering of the leaves; those to be rejected that have produced a flowering stem. *Aromatic herbs* to be collected in dry places exposed to the sun. *Acrid plants* in damp, marshy localities, always in dry weather and at the commencement of flowering. *Leaves* from plants just commencing to bloom, they are to be fully developed and gathered some hours after sunrise. *Flowers* as soon as full-blown, except rose and, I may add, orange, which should be selected before complete expansion. *Labiate* flowers to include calyx. *Seeds* to be kept in their natural envelopes, except in the case of fleshy fruits. *Barks* to be taken in spring-time from branches of moderate age. *Woods* in winter, being then charged with more active matter than at other seasons.

Essential Oils, intended for making extemporaneous waters, are directed to be mixed as soon as distilled with rectified spirit, in the proportion of one part oil to nine of rectified spirit. I have had no experience as to whether this treatment preserves the freshness of all essential oils, but it would seem probable, as oil of lavender develops a finer odour under similar circumstances.

All formulæ are given in parts, not weight and measure, which is a good method, and will, no doubt, be adopted by us.

Commencing with compound preparations, the first on the list are—

Decoctions.—These, for the most part, are ordered to be macerated for about an hour, then boiled for fifteen minutes over a fire, and finally strained with pressure while hot. They are generally double the strength of infusions.

Extracts are a series of preparations on which great attention has been bestowed, and which have evidently been one of the pet subjects of the compilers. They are either moist or dry, and, for convenience' sake, will be divided into several heads. In the first place, the liquors are directed to be evaporated in parts, so as to avoid too long a continuation of heat; a wise precaution where much evaporation is required. Proceeding to review them, we find—

1st. Those prepared from dry herbs or roots which are exhausted by successive portions of water at 20° to 30° Cent. The first liquors being necessarily the strongest are to be set aside, and the more dilute after portions evaporated to about half, when the first yield is to be added, and the resulting coagulum separated before further evaporation. When finished, these preparations should

contain 15 per cent. of water. In this class are absinthium, arnica, chamomile, and senna, with rhubarb, valerian, chelidonium, gentian, cynoglosse, acorns, and belladonna roots.

2nd. Extracts prepared by cold maceration and percolation, finally reduced by a gentle heat to a pilular consistence. In this section we find gall-nut, rhatany, logwood, pomegranate-root, dulcamara, polygala senega, &c.

3rd. Alcoholic extracts, which are to have 10 per cent. of moisture. There are twenty-eight of these, amongst which are squill, arnica, cascarilla, colchicum bulb and seed, colocynth, ipecacuanha, senega, rhus radicans, saffron, sarsaparilla, valerian, &c.

4th. Ethereal extracts, by maceration and percolation, to be reduced to the consistence of honey. Amongst these are croton, cubebs, cantharides, mezereon, santonica, and elecampane.

5th. Dry extracts, prepared by evaporating the clarified coagulated juice to a syrupy consistence, and then stirring in sufficient quantity of the powdered herb to form a stiff paste, which is dried by being spread thinly on plates and exposed to a gentle heat. They are to be kept powdered. In this section are pulsatilla, belladonna, chelidonium, hemlock, henbane, wild lettuce, rhus radicans, stramonium, &c. In narcotic remedies, should the prescriber omit to mention the kind of extract intended, the dispenser is to employ one of this class.

6th. Dry extracts, with the fecula. These are prepared by the simple evaporation of the strained juice and the product obtained by the subsequent addition of a little water to the marc, until of such consistence as to be readily spread on plates to dry. These are also to be kept powdered. It will be seen that the fecula here takes the place of the powdered herb in the last section. Our old friends belladonna, hemlock, henbane, rhus, wild lettuce, and stramonium, again occur in this list, with cultivated lettuce and foxglove.

Besides the above-noticed modes of preparation, there are others that belong to neither section, such as the watery extracts of aloes and myrrh, and the spirituous extracts of catechu and aloes, all of which are to be dry. Then there is the Extractum Ferri Pomatum, made by macerating for some days one part of iron-filings in eight parts of sour apple juice, boiling the mixture to half, straining, and finally evaporating, so that the extract, or rather pill, may contain 15 per cent. moisture. Extracts are also made from the *seeds* of henbane, belladonna, and stramonium. Ergot of rye is prepared according to the process of Bonjean, by macerating and percolating the powdered ergot with q. s. of water, evaporating the liquors to a syrupy consistence, then adding alcohol until there be no longer a precipitate given, even after setting aside for some hours. The filtered solution is then reduced to a proper consistence. The yield by this method is only about one-thirtieth of extract.

Jellies are ordered to be prepared from Corsican, Iceland, and Irish mosses, also from arrowroot, salep, hartshorn, &c.

Infusions are to be made in closed vessels, the ingredients being added to the water, and the whole heated to the boiling point, are then taken from the fire, and strained after seven or eight minutes' maceration. In the case of volatile substances or aromatic herbs, the infusion is to be left until cool, before being strained. There are also some infusions prepared by cold percolation.

Lozenges are directed to be prepared from porphyrized iron, and the citrate, potassio-tartrate, iodide, and lactate of the same metal. These must be of eminent use for discolouring the teeth, and one might be led to infer that a dentist as well as a veterinary surgeon formed one of the commission. Other lozenges are prepared from charcoal, orris, santonine, burnt sponge, &c.

Ointments.—These preparations only require passing notice. The citrine ointment differs widely from the P. L. preparation, and is made according to

the following formula :—Mercury 69, Nitric acid (at 36° Beaumé) 103, lard and olive oil of each 414 parts. This forms a very stiff compound, which is poured into paper moulds while hot. The advantage of this ointment is that it is less liable to decompose than the London; but, on the other hand, it is more difficult to mix with other fats. A cerate employed for keeping open blisters is made from mezereon, and another, used for the same purposes, is prepared with the ethereal extract of the same plant.

Pills contain nothing very interesting. There is a pill of copaiba and cubebs, made into a mass with yellow wax. Another is made of protiodide of iron, and is directed to be rolled at once into pills, and coated with balsam of tolu, after having received a coating of powdered metallic iron.

Plasters, like most of their preparations, contain the narcotics, such as henbane, conium, belladonna, stramonium, aconite, &c. There is also a plaster of verdigris, and an aromatic and simple plaster of opium.

Powders, although numerous, are not of interest as regards novelty.

Syrups are very numerous, being above 120. The favoured narcotics figure here also, digitalis being represented by no less than three formulæ. Other syrups more or less remarkable to British Pharmaceutists are those of hydrocyanic acid, ergot of rye, cod liver oil, bichloride of mercury, dextrine, guaiacum, tar, iodide of starch, lactate of iron, bilberry, santonine, Venice turpentine, besides a host of others.

Tinctures are either prepared with alcohol or ether, and are divided as follows :—

1. Alcoholata. These may be described as spirits, and are made by mixing the necessary ingredients with spirit of various densities, and distilling until the requisite quantity of product be obtained. Amongst them we find one containing saffron; another made simply with orange-flowers. There is the alcoholatum aromaticum, alcoholatum aromaticum cum croco, and alcoholatum polyaromaticum—which terms sufficiently imply the "cordial" nature of these preparations, one of which has twelve different herbs in its composition.

2. Alcoholeta, which are generally solutions of essential oils in spirit; for the most part simple. Some are very remarkable formulæ, and might as well have been placed with the tinctures. Thus alc. lavand. co. is made by distilling spirit with lemon-peel and lavender flowers, and afterwards macerating cloves, cinnamon, and cubebs in the product of distillation, then adding, according to instructions, "as much alkanet root as would give a fine red colour to the liquid." This, perhaps, bears the prize of all authorized formulæ. Nor is this class less interesting in nomenclature, when we think of such names as "alcoholetum saponato-camphoratum liquidum" and "solidum"—preparations otherwise known as opodeldoc. There is also a soap liniment with acetic ether, directed to be prepared extemporaneously. An aromatic spirit of ammonia containing carbonate, and an anisated spirit of caustic ammonia, are with this class.

3. Tincturæ. These are very numerous, being above 150. Amongst them are mace, elecampane, ambergris, Canadian and Siberian castor, euphorbia, gamboge, mastic, gum-lac, ipecacuanha, amber, vanilla, &c.; and we must not forget those made with fresh herbs. These are confined to the narcotics, and are made by equal weights of bruised fresh herb and rectified spirit. Not content with the narcotic tinctures from dry and fresh herbs, another class of these products is ordered, which are made with pure ether. These are not only for the most part superfluous, but highly dangerous; the great volatility of the menstruum rendering them liable to variation from evaporation.

Waters are made either by direct distillation from the ingredients, or by mixing the essences mentioned under the head of essential oils with a certain quantity of distilled water, in the proportion of three parts of the former in a

thousand of the latter. There is a water made with belladonna, others with assafœtida, valerian, bitter almonds, tobacco, &c.

Wines are prepared with white, red, and Malaga wines.

The other preparations of the Pharmacopœia are made up of expressed juices, amongst which again figure the narcotics, of cigarettes, &c. &c. A great many formulæ occur in the appendix, where also are to be found ointment for mange, and a remedy for sheep; also, a depilatory paste, and a phosphorus vermin destroyer—in fact, such a repertorium of sundries as to give one the idea of a piracy from Beasley.

In conclusion, it is pretty evident that too much repetition in some clasess of preparations renders the book anything but a thoroughly practical one. It is like a continental dinner, where a score of dishes are made from one joint. There is "narcotic" boiled, stewed, roasted, and cooked to death in various ways, all dished up with widely differing names, but answering the same end, and traceable to the same origin. The result of this multiplicity is, that the medical commissions in the various provinces are invested with power to select such of the medicines as may be deemed necessary to the wants of their several districts, and these only are enforced to be kept in their respective Pharmacies. All other preparations are voluntary. Imagine a Pharmacien doing a snug little business of four or five francs a day. How many extra things would he trouble himself about? Not many. It may therefore happen that a prescription from the north of Belgium would be with difficulty prepared in the south —an astonishing dilemma in a country so small. It is but justice to mention, that although the Belgian Pharmacies are frequently small, and present but a beggarly show as regards contents, they are not unfrequently kept by men of good capacity in different branches of science; and perhaps botany and chemistry are better understood by them than Pharmacy and hard work.

Brussels, November, 1860.

REPORT OF THE

RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION,

AND OF THE

APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

On Spectrum Analysis.—The colours which certain of the metals, but more especially those of the alkalies and alkaline earths, are capable of imparting to flame, have been always regarded by chemists as a valuable means of recognizing and detecting these metals in the course of an analysis; unfortunately, however, the methods of observation hitherto employed have been so imperfect as to materially limit the value of these flame tests. When any salt of one of the metals referred to exists in the pure state, it may generally be recognized by the colour it will communicate to flame, although, even in this case, we may have to distinguish between mere shades; but when these metals have to be detected in presence of each other, then this mode of proceeding becomes almost useless, in consequence of the manner in which the colour of one metal masks that which may be produced by another. The metal sodium pre-eminently interferes in this way—the intense yellow colour which it gives being produced by so extremely minute a trace as to render its separation a matter of great difficulty, while it is sufficient to mask the evidence of other metals.

It will be remembered that a year or two back Mr. Cartmel devised a means of overcoming this difficulty, which consisted in the employment of coloured media through which to view the flame. Mr. Cartmel's method applied particularly to the metals of the alkalies. He showed that a solution of sulphate of indigo was capable of entirely absorbing the yellow rays produced by sodium, and transmitting only

the red of lithium; while cobalt-blue glass was capable of absorbing both the yellow and the red, and transmitting only the violet of the potassium.

Professors Kirchhoff and Bunsen have quite recently published the results of some valuable investigations upon the detection of these metals by means of the coloured rays which they originate, in which the observations are made, not upon the flame itself, but upon the spectrum produced by decomposing the light of the flame with a prism. By this method great precision and accuracy is given to the results, as the position in the spectrum of the coloured lines characteristic of each metal may be accurately measured and determined. The authors first obtained, in as near a state of absolute chemical purity as possible, the chlorides of the metals potassium, sodium, lithium, strontium, calcium, and barium. A portion of each of these was then volatilized in the flame of a Bunsen's gas burner, and the spectrum obtained. In the memoir of Professors Kirchhoff and Bunsen, which has been translated entire in the *Journal of the Chemical Society*, a coloured plate is given, showing the distinctive appearances which these spectra present.

The apparatus employed in making these observations is unfortunately somewhat complicated. It consists essentially of a box blackened on the inside, having its horizontal section in the form of a trapezium; the two inclined sides of the box, which are placed at an angle of about 58° from each other, carry two small telescopes. The eye-piece of the first telescope is removed, and in its place is inserted a brass plate bearing a vertical slit. A Bunsen's gas burner stands before this slit. The salt to be tested is held in the flame by means of a fine platinum wire. The second telescope is used for observing the spectrum. Between the object glasses of the telescopes is placed a hollow prism, filled with bisulphide of carbon, and having a refracting angle of 60°. This prism is movable about a vertical axis, the axis bearing upon its lower part a mirror. Another small telescope, placed some way off, is directed towards the mirror, and through this telescope an image of a horizontal scale fixed some distance off is observed. By turning the prism round, every colour of the spectrum may be made to move past the vertical wire of the observing telescope, and any required position in the spectrum thus brought to coincide with this vertical line. Each particular portion of the spectrum thus corresponds to a certain point on the scale.

A great number of experiments were made by the authors, with the view of ascertaining whether any alteration took place in the spectra by varying the conditions and circumstances of the experiment, particularly with reference to the flame employed. Thus it was found that the bright lines showed themselves most plainly when the temperature of the flame was highest and its illuminating power least, and hence Bunsen's burner was selected as the most suitable for the purpose. A great number of other flames were, however, tried. As the result of these experiments, it appears that neither the alteration of the bodies with which the several metals may be combined, nor the variety of the chemical processes occurring in the several flames, nor the wide differences of temperature which these flames exhibit, *produce any effect upon the position of the bright lines in the spectrum which are characteristic of each metal.*

This method of testing, then, by spectrum observations appears to be one of great certainty and extreme delicacy; it moreover admits, under certain circumstances, of the detection of all the metals of the alkalies and the alkaline earths, in one operation and in presence of each other, as the authors proved by operating upon a mixture of the chlorides of all these metals, containing at the most one-tenth of a milligramme of each of the salts.

Sodium and lithium are stated by the authors to give more delicate indications by the spectrum than any of the other metals. Thus, they proved that quantities of sodium salt less than $\frac{1}{3000000}$ of a milligramme could be detected with the greatest ease; and $\frac{9}{1000000}$ of a milligramme of carbonate of lithium was distinguished with absolute certainty. The great facility of operating, and the extreme delicacy and certainty which this method of examination for lithium possesses over all others, has enabled the authors to point out a fact somewhat contrary to our foregoing experience, namely, that the metal lithium exists most widely distributed through nature, and that it occurs in small quantities in almost all bodies. Lithium was easily detected in 40 cubic centimetres of the water of the Atlantic Ocean, collected in 41° 41′ N.

latitude, and 39° 14′ W. longitude. Ashes of marine plants (kelp) driven by the Gulf stream on the Scotch coasts, contain evident traces of this metal. All the orthoclase and quartz from the granite of the Odenwald which was examined contained lithium. A very pure spring water from the granite in Schlierbach, on the west side of the valley of the Neckar, was found to contain lithium. The water supplying the Heidelberg laboratory was shown, on the contrary, to contain none of this metal. Mineral waters, in a litre of which lithium could hardly be detected by the ordinary methods of analysis, gave plainly the red line in the spectrum, even if only a drop of the water on a platinum wire was brought into the flame. All the ashes of plants growing in the Odenwald on a granite soil, as well as Russian and other potashes, contain lithium. It was found also in the ashes of tobacco,* of vine leaves, of the wood of the vine, and of grapes, as well as in the ashes of the crops grown in the Rhine-plain, near Waghäusel, Deidesheim, and Heidelberg, on a non-granitic soil. The milk of the animals fed upon these crops also contains lithium. The quantity of this metal present in the vine is such, that, in the manufacture of tartaric acid, considerable quantities of lithium salts can be prepared from the mother liquors. In the examination of the mother liquor of a mineral spring also, 4 litres of the liquor yielded half an ounce of carbonate of lithia. A great number of other mineral spring mother liquors showed a similar richness in compounds of lithium.

The spectra given by the metals of the alkaline earths are not quite so simple as those produced by the alkalies; they are, however, sufficiently characteristic. In the case of all the metals which admit of detection by the spectrum, the authors recommend that they should, by preference, be introduced into the flame in the state of chloride, on account of the greater volatility of that combination. When the metal is associated with a non-volatile acid, as, for instance, when it exists in a native silicate, the reaction is not produced, unless the metal is present in very considerable quantity. In the case of potassium this difficulty is readily removed by simply fusing the substance to be examined with carbonate of soda. The presence of the sodium does not in the least interfere with the test, and scarcely diminishes its delicacy.

In some other cases the authors recommend a different mode of proceeding, as, for instance, in the case of silicates of lime which are not decomposed by hydrochloric acid, they indicate the use of fluoride of ammonium and sulphuric acid.

This method of spectrum analysis, from the peculiar facilities it affords for the detection of minute quantities which might escape other methods of examination, has given the authors a clue to a very important discovery, namely, the *existence of a hitherto unknown elementary body.* This new element is regarded by the authors as a member of the group of alkaline metals, of which it would form the fourth term. It is characterised by communicating to the spectrum two blue lines, one more intense than the other, and rivalling the lithium line in brightness and distinctness of outline. At present this new metal has only been found in a few mineral waters of Germany. The authors are engaged in the further investigation of its properties; they state, however, that while its nitrate is soluble in alcohol—thus distinguishing it from potassium—it yields a yellow precipitate with chloride of platinum.

On the Carbonates of Copper.—At a recent meeting of the Chemical Society, a paper was read by Mr. F. Field, describing some interesting facts in connexion with the carbonates of copper. Mr. Field's experiments were undertaken in the hope of obtaining a neutral carbonate of copper (CuO, Co_2), an attempt which, however, proved unsuccessful. The author showed that upon the addition of sulphate of copper to a large excess of a solution of sesquicarbonate of soda, no precipitate is obtained, and it is only when a considerable quantity of the copper salt has been added, that a slight precipitate is formed, which even then, upon gently warming, is redissolved, yielding a bright blue solution. Upon boiling this liquid for a considerable time, a granular green precipitate is thrown down, the liquid still retaining copper in solution, and maintaining its blue colour. After filtration, this liquid is found to be capable of dissolving a still further quantity of

* The presence of lithium in the ashes of tobacco may be readily rendered evident by the more simple method of Mr. Cartmel's. If the end of a cigar be held in the flame of a Bunsen's gas-burner, and then viewed through a solution of sulphate of indigo of the proper strength, the characteristic red flame will be at once perceived.—Reporter.

oxide of copper, which is again precipitated as a green powder by boiling. If the filtrate from the last precipitate be submitted to prolonged ebullition, on the addition of sulphate of copper a dense black precipitate is obtained.

The green precipitate which was thus obtained, was found upon analysis to consist of the ordinary dicarbonate of copper, corresponding in composition with malachite (2 CuO, Co_2, HO).

The black precipitate had the composition 6 CuO, Co_2 or 4 CuO + 2CuO, Co_2.

It was found to be scarcely possible to deprive this precipitate of the whole of its carbonic acid by boiling it in the liquid from which it was thrown down. By thoroughly washing it, however, and then boiling it in pure water, its entire decomposition was rapidly effected. When ordinary powdered malachite, or the artificially prepared green dicarbonate, is introduced into boiling water, a similar decomposition takes place; the compound blackens in a few minutes, and after half an hour's boiling is entirely converted into black oxide.

The highly basic black carbonate referred to above, may be readily obtained by adding either powdered malachite, or artificial dicarbonate, or solution of sulphate of copper to a great excess of a solution of carbonate of soda, boiling for a few minutes and then filtering. The black precipitate so produced is found always to have the uniform composition 6 CuO, Co_2.

On a New Ammonio-Chrome Compound.—Mr. J. Morland has shown that when sulphocyanide of ammonium is fused, and powdered bichromate of potash added to it, in the proportion of two of bichromate to five of sulphocyanide, this salt dissolves quickly at first, giving a purple coloration. After a short time, however, a very brisk reaction ensues, ammonia and aqueous vapour are given off abundantly, and the residue is of a beautiful crimson colour. This residue consists of sulphocyanide of ammonium and of potassium, bichromate of potash, sulphate of potash, and the sulphocyanide of a new ammonio-chrome compound. This last salt is easily purified from the others by washing with cold water—in which it is but sparingly soluble—and afterwards by crystallization from alcohol, which dissolves it freely, or from ether, in which it is moderately soluble. This new salt has the composition $Cr_2\,Csy_3\,2\,NH_4O$. It is perfectly neutral; crystallizing in the cubical system. Neither acids nor alkalies decompose it in the cold, but alkalies on boiling throw down oxide of chrome; and acids when concentrated decompose it by uniting with the ammonia.

ON ATMOSPHERIC CORPUSCLES.

BY M. F. POUCHET.

I HAVE thought for a long time that the study of the bodies conveyed by the air into the respiratory passages of animals would offer interesting physiological results, and throw considerable light upon the subject of atmospheric micrography. Nor have I been deceived in this. In fact, in almost every class of animals, the examination of the respiratory apparatus clearly reveals the various modifications of the medium inhabited by them. But it seemed to me that the most important notions on this subject would be presented in those animals in which the air penetrates the most deeply into the organism. Birds, consequently, have become the objects of particular attention, seeing that in them the air, after traversing the lungs, pervades not only the different cavities of the trunk, but reaches also the interior of the osseous system. In these animals I have devoted particular attention to the examination of the bones which contain most air, and chiefly to the *humerus*. And as in these situations the corpuscles, once introduced, escape only with great difficulty, owing to the immobility of the walls and the irregularities of their anfractuosities, we there find ample vestiges of all the matters conveyed by the air into the respiratory organs.

The examination of animals living in the midst of towns, and in the interior of our dwellings, will excite surprise by the enormous quantity of starch-grains contained in their respiratory organs. In birds, corpuscles of this nature will be discovered in great abundance, even in the interior of the bones, and together with them will be observed, in profusion, particles of sooty matter and filaments derived from the various fabrics of which our clothes are made. But the further the creature lives from towns,

the more remote and wild its habitation, the more rare also become all these corpuscles in the inspired air. Under these circumstances, scarcely any traces of the sort can be observed. Frequently, even not a single particle of the kind in question will be observed in animals or birds living altogether in the midst of forests; in these animals, on the other hand, the whole respiratory apparatus is filled with abundant débris of plants,—epidermis, chlorophyll, &c.

The amylaceous particles disseminated either in the atmosphere or in the interior of animals present two conditions—they are either in the normal state or cooked. In the majority of cases the starch is found in the former condition; but, nevertheless, we frequently meet, in the atmosphere, and in all the cavities of animals into which the air enters, with starch-grains, either simply swelled or entirely burst by the action of heat. The latter certainly proceed only from minute particles of bread carried about by the movements of the atmosphere. This panified starch is readily recognized by its enormous size and ruptured condition, and by the action of iodine, which does not produce in it the same bright colour as it does in ordinary starch-grains.

The birds which inhabit the interior or live in the close vicinity of towns do not obtain this abundance of amylaceous particles simply from the air they inspire; they derive, besides this source, an abundant supply from the foliage of the trees amidst which they pass part of their lives. In fact, on examining the surface of the leaves of trees in the neighbourhood of cities, when they have not been washed for some days by rain, abundance of specimens of every sort of corpuscles carried in the atmosphere will be found on them, and, universally, a considerable quantity of starch-grains, together with sooty and siliceous particles. On a single leaf of a horse-chestnut, growing in the garden of the Ecole de Médecine at Rouen, I have counted about thirty grains of wheat-starch, either in the natural or panified condition.

The search for atmospheric corpuscles in the respiratory passages is easily made. It consists simply in the passing of a stream of water through these passages, and the collection and examination of the fluid. For this purpose I inject the trachea, by means of a syringe, and when the lungs are distended with water, make incisions into them, and carefully collect all the fluid that escapes, repeating the injection several times.

In birds I inject the trachea, and when the water has traversed the lungs and filled all the air-cavities of the body, I open the thoracic cavity, and collect the liquid, which escapes in a jet. In all the experiments the fluid is received in conical vessels with a narrow bottom, and when sufficient time has elapsed to allow all the corpuscles to subside these are removed by means of a very slender pipette, and submitted to microscopic examination. The atmospheric corpuscles may be collected from the hollow bones by the same mode of procedure. To effect this, I insert the tube of a syringe into the orifice, by which the air penetrates into the cavity, and then make a section of the bone at the opposite end. The water injected, at first gently, and afterwards with great force, in order to carry along with it the smallest corpuscles, is received in champagne-glasses and examined. Studied in this way, the respiratory organs afford a faithful idea of the life of the animals. Not only does the examination reveal to us what sites of habitation the animals prefer, and their kind of food, but even, when they are domesticated, the profession followed by their owners.

I have found in the air-passages of man the same atmospheric corpuscles as are met with in animals. In the bodies of two persons who died in one of our hospitals, a man and a woman, whose lungs I injected, I found a large quantity of wheat-starch, either normal or panified; particles of silex and of glass; fragments of dye-wood, of a beautiful red colour; fragments of dress, and, lastly, a larva of a microscopic arachnidan, still living.

It was rational to conclude that, at certain times, the expectoration should contain corpuscles similar to those I have described in the lungs. And this is actually the case; I have here met with normal and panified starch-grains, particles of soot, the débris of plants, filaments of wool or cotton of various colours, particles of silex, &c.

A fowl, brought up in a paved court at Rouen, afforded in its respiratory sacculi an enormous quantity of wheat starch, normal and panified. Besides which they contained numerous filaments of cotton and of linen, and an abundance of sooty particles; there were but a very few siliceous grains, a circumstance probably owing to the habitation in which the bird had existed. The humerus of this bird also

contained much starch, particles of soot, a considerable number of cotton and linen filaments, and even some grains of potato-starch and of glass.

Thinking that in animals living in localities where starchy matters formed an object of trade, the abundance of amylaceous particles would be still greater, I procured two young chickens which had been kept for two months by a baker. My surmise was not unfounded. The whole of the respiratory organs in these chickens, notwithstanding their youth, contained an amount of starch surpassing that which I had found in the fowl.

A pigeon taken from a dovecot in the middle of the town presented, in its respiratory passages, besides particles of silex and soot, the débris of stuffs of various colours and a few grains of potato-starch, together with a considerable amount of wheat-starch of all sizes, and, above all, an enormous quantity of lentil-starch. Even the *humeri* contained so much of the latter, that from eight to ten grains were found in every case. I was unable to explain the presence of such an abundance of lentil-starch in a bird which always swallows seed without bruising it. But I very soon discovered the source on examining the floor of the dovecot. This was completely covered with the dung of the pigeons, containing an enormous quantity of this sort of starch, which had passed through the intestines unaltered. In flying about in their dwelling, the birds diffused this in the air, and it thus gained an entrance into their respiratory organs.

The examination of a bird which is ordinarily kept only in wealthy establishments affords another proof of what has been said. In fact, the numerous vestiges of magnificent stuffs exhibited in its respiratory organs manifestly recalled the luxurious dresses or works of those amongst whom it had lived. This bird was a peacock. Unfortunately I had at my disposal only its *humeri;* but having injected them, I was really struck with the abundance of, and the splendid colours presented by, all the fragments of stuffs contained in these bones. I found, besides a considerable quantity of wheat-starch, numerous filaments of wool and of silk of the most magnificent blue, of a beautiful rose, and bright green.

The lungs of a mouse also afforded starch, silex, and soot, but in far less quantity, and in far smaller fragments, than in birds.

But if our attention be directed to wild birds, residing at a distance from cities, we observe a totally different thing.

A grey falcon (*Falco cineraceus*, Mont.), killed in a large forest two leagues from any habitation, did not afford the least trace of starch, either in its air-passages or within the bones. There were met with only a few particles of soot and silex; and not a single filament of any kind of tissue was recognized. But, on the contrary, all the air-passages were filled with an abundance of the detritus of plants and débris of insects.

In another wild bird (*Picus viridis*, Linn.) I found in the air-passages only an insignificant quantity of starch, and very little soot and silex.

In some frogs taken in the basins of the Jardin des Plantes at Rouen, which is situated close to numerous factories and in a populous quarter, the lungs have always afforded a notable quantity of starch, an abundance of particles of charcoal and coal-soot, together with numerous fragments of silex and vegetable débris. Besides these, filaments of cotton, raw or manufactured, were extremely abundant. The respiratory organs of these animals also contained *Naviculæ*, diatoms, papilionaceous scales, the stems of mucedinous fungi, and fragments of confervæ.

If, again, we explore the respiratory passages of some animals which, although living in a state of liberty, are in the habit of frequenting our dwellings, we find in them evident vestiges of their double existence, wild and domestic.

A jackdaw afforded a striking instance of this. Its respiratory organs contained a very considerable quantity of wheat-starch; and what was very remarkable, an enormous number of sooty particles—a circumstance which is accounted for by the almost habitual abode of this bird on the lofty buildings of towns. There were found also, in its air-sacs, numerous filaments of cotton and abundant débris of plants.

In all my observations, which, without exaggeration, might be counted by hundreds, I have never met with either a *single spore* or a single ovum of a microzoon, nor with any encysted animalcule. Moreover, if in all these minute researches I have always been able to detect starch-grains wherever they existed, is it possible that the

atmospheric spores and ova alone should have escaped detection? The ova of certain *Paramœcia*, being .0420 mm. in diameter, and consequently surpassing considerably in bulk the largest grains of wheat-starch, whose diameter does not exceed .0336 mm., if they really existed in the atmosphere in sufficient quantity to explain the generation of Infusoria, whose apparition astonishes and stupifies us, should have been immediately discovered in the same situations, and far more easily, even, than the starch-grains, seeing that they ought to exist in much greater numbers. To a negation of this kind, in the actual state of science, but one answer is possible—*show these ova.*—*Comptes Rendus*, 1860.—*Quarterly Journal of Microscopical Science.*

ON THE ORIGIN OF FERMENTS.

BY M. L. PASTEUR.

Among the questions arising during the researches which I have undertaken on the subject of fermentations properly so termed, there is none more worthy of attention than that which relates to the origin of "*ferments.*" Whence proceed these mysterious agents, so feeble in appearance, and yet in reality so powerful; which in the minutest quantity, measured by weight, and with insignificant external chemical characters, possess such extraordinary energy? It is in an attempt to solve this problem that I have been led to the study of the so-termed spontaneous generation.

In the communication which I had the honour of submitting to the Academy on the 6th of February last, I mentioned only a single fluid appropriate for the development of Infusoria and Mucedinea, although I gave a general method applicable to all liquids.

On that occasion I showed, in a manner that has been contested only in appearance —First, that the solid particles conveyed in the atmospheric air were the origin of all the vegetable and animal productions peculiar to the fluid in question. Secondly, that these particles, examined under the microscope, are amorphous, dusty atoms, constantly associated with certain corpuscles, whose form, volume, and structure show that they are organized after the manner of the ova of Infusoria or of the spores of the Mucedinea.

I am, at present, in a condition to extend the assertions contained in the communication of the 6th February to two substances, still more alterable than the sugared water mixed with albuminous matters which had been more particularly the subject of my former experiments. I now speak of "milk" and "urine." The details of the results derived from these two fluids will show, as I hope, the kind of future in store for this department of study.

I introduce about 100 cubic centimeters of recent urine into a flask capable of containing 250 cubic centimeters. The drawn-out neck of the flask communicates with a platinum tube, heated to redness. The liquid is made to boil for two or three minutes, and then allowed to cool. When refilled with air, which has been subjected to a red heat, the flask is hermetically closed.

The flask, under these conditions, may remain for an indefinite time in a stove, at a temperature of 30° C., without its undergoing any alteration. After the lapse of a month or six weeks, I cause a small quantity of amianthus charged with the atmospheric dust to fall into the flask, the mode in which this is effected being precisely that described in the *Comptes Rendus* of the 6th of February. The neck of the flask being then again hermetically closed, the apparatus is replaced in the stove.

In order to be sure that the manipulation to which the flask is submitted, for the introduction of the atmospheric dust, does not itself in any way affect the result of the experiment, I prepare a second flask similar to the other; only that, instead of allowing amianthus charged with atmospheric dust to fall into it, I substitute the same amianthus previously calcined for some moments before its introduction into the flask.

The following are the constant results of the experiments so made.

The fluid in the flask which has received the amianthus deprived of the atmospheric dust remains unaltered at the temperature of 30° C., whatever may be the duration of its exposure to this heat, which is so favourable to the putrefaction of urine. On the contrary, at the end of six hours, the urine which has received the atmospheric

dust, presents organized products—Mucedinea or Infusoria. Among the latter I have noticed chiefly *Bacteria*, very minute *Vibriones*, and *Monads*, in fact, the same Infusoria that I have found in the same urine exposed to the contact of the atmospheric air at a temperature of 30° C. During the following days will be witnessed an abundant deposition of crystals of ammoniaco-magnesian phosphates and of the alkaline lithates. The urine becomes more and more ammoniacal. Its urea disappears under the influence of the true ferment of the urine, a ferment which I have proved to be organized, and whose germ could only have been introduced in the atmospheric dust, as well as that of the Infusoria or of the Mucedinea.

Milk exhibits still more interesting properties. I have said that, before filling the flask with air which has been subjected to a red heat, and hermetically closing it, I caused the urine to boil for two or three minutes. This duration of the ebullition is sufficient, and everything leads me to believe that even less careful precautions will suffice to deprive of all viability the germs which may have fallen into the urine subsequent to its emission.

This being granted, let us repeat, without any change, the operation above described—now, however, not upon urine, but upon fresh milk; that is to say, after this fluid has been boiled for two or three minutes, and the flask has been refilled with air heated to redness, let us keep it closed at a temperature of 30° C.

After a variable lapse of time—generally of three to ten days—the milk in all the flasks thus prepared will be found coagulated. Under the prevalent views respecting the phenomenon of the coagulation of milk, there is nothing in this circumstance to excite surprise. When milk, it is said, is exposed to contact with the oxygen of the air, the albuminous element is altered and acts as a ferment. This ferment reacts upon the sugar of the milk, and transforms it into lactic acid, which then precipitates the casein. This is the cause of the coagulation. In reality, however, things are quite otherwise. For if one of these flasks in which the milk is coagulated be opened, it is obvious, on the one hand, that the milk is *as alkaline as fresh milk;* and on the other—a circumstance tending to encourage the belief in spontaneous generation—that the milk is filled with Infusoria, most frequently with Vibrios, as much as $\frac{1}{20}$th millimeter in length. As yet I have not met with any vegetable production under these circumstances.

From these facts we must admit—First, that the phenomenon of the coagulation of milk, as I hope shortly to demonstrate more clearly, is a phenomenon upon which we have had but very imperfect notions. Second, that *Vibrios* may arise in a liquid of the nature of milk which has undergone ebullition for several minutes at a temperature of 100° C., although this is not the case with respect to urine, nor to a mixture of sugar, water, and albumen. Is it the case, then, that under particular conditions we may have spontaneous generation? We shall soon see how far this conclusion would be erroneous. Let the milk be boiled, not for two, but for three, four, or five minutes, and it will be found that the number of flasks in which it coagulates from the presence of Infusoria diminishes progressively in proportion to the longer duration of the ebullition. And lastly, if the ebullition be carried on at a temperature of 110 to 112 degrees, under the pressure of $1\frac{1}{2}$ atmosphere, the milk will never afford any Infusoria. Consequently, as they do arise under the conditions existing in the former experiments, this is evidently due to the circumstance that the fecundity of the germs of the *Vibrios* is not entirely destroyed, *even in water* at a temperature of 100°, kept up for some minutes, and that it is more affected by a longer ebullition at that temperature, and wholly abolished at the temperature of 110° to 112° C.

But what is to be said concerning the phenomenon of the coagulation under those special conditions of ebullition, in which the milk in contact with calcined air never affords any Infusoria? One remarkable fact is, that the *milk does not coagulate.* It remains alkaline, and preserves, I would venture to say, entirely all the properties of fresh milk. Then if, into this milk, thus retaining its integrity, the atmospheric dusty particles are introduced, it changes and coagulates, and the microscope shows the existence in it of divers animal and vegetable productions.

It would be very interesting to ascertain whether the fluids belonging to the animal economy, such as milk and urine, contain normally or accidentally, previously to all contact with the common air, the germs of organized productions. This is a question which I hope to resolve in a subsequent communication.

The generally admitted theory of ferments, and that which of late years had received fresh support from the writings or the labours of various chemists, consequently appears to me more and more incongruous with experiment. The "ferment" is not a dead substance, without determinate specific properties. It is a being, whose germ is derived from the air. It is not an albuminous substance, altered by oxygen. The presence of albuminous matters is an indispensable condition of all fermentation, because the "ferment" depends upon them for its life. They are indispensable in the light of an aliment to the ferment. The contact of the atmospheric air is, primarily, equally an indispensable condition of fermentation, but it is so in virtue of its being a vehicle of the germs of the "ferments."

What is the true nature of these germs? Do they not require oxygen, in order to pass from the state of germs to that of adult ferments, such as are met with in the products undergoing fermentation? I have not yet arrived at any fixed conclusion with respect to these grave questions. I am endeavouring to pursue the inquiry with all the attention it merits; but the really capital difficulty of these studies consists in the isolated, individual production of the various ferments. I may assert that there are a great many distinct, organized ferments, which excite chemical transformations, varying according to the nature and organization of the ferment. But in most cases the nutriment suitable to some allows of the development of others of them, whence arise the most complicated and the most variable phenomena. If we could only isolate one of these ferments, in order to develop it by itself, the chemical transformation corresponding to it would take place with remarkable precision and simplicity,

I shall, in a short time, give a new instance of this, in describing the organized ferment proper to the fermentation termed "viscous."—*Comptes Rendus*, May, 1860.

ON THE NON-EXISTENCE OF COMBINATIONS OF HYDROGEN WITH IRON AND ZINC.

BY DR. CHARLES A. CAMERON, M.R.I.A., F.C.S.
Professor of Chemistry, &c.

THE terms "zincuretted hydrogen" and "ferruretted hydrogen" occur in several standard works of recent date; such, for instance, as Booth's *Encyclopædia of Chemistry*, 1852, and Hunt's *Poetry of Science*, 1854. These terms indicate compounds which are supposed to be formed during the dissolution of iron and zinc in hydrochloric or sulphuric acid. The production of zincuretted hydrogen, in this way, at least, was doubted by Berzelius,* and proved not to be the case by Fresenius, whose experiments are detailed in Gmelin's Chemistry, a book which was published before either of those referred to above. I, also, have made this the subject of experiment, not only for the purpose of proving whether or not compounds of zinc and iron with hydrogen are formed during the dissolution of these metals in dilute sulphuric acid; but also to determine whether or not such bodies can be formed at all. My experiments were conducted in the manner described as follows :—

Iron turnings were dissolved in cold dilute sulphuric acid, and the hydrogen gas which was evolved was conducted, after washing in distilled water, into a receiver containing nitro-hydrochloric acid. The evolution of the gas was continued for the period of two hours, and at the conclusion of the operations the acid contents of the receiver were neutralized with caustic ammonia, the resultant saline solution concentrated, acidulated with a little pure hydrochloric acid, and tested for iron in the usual way; but without the slightest trace of that metal being detected therein.

Now, as arseniuretted and antimoniuretted hydrogen are readily decomposed by nitro-hydrochloric acid, it is only reasonable to infer that ferruretted hydrogen, if such a compound had been formed during the operation I have described, would have been similarly affected by this agent.

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* On prétend que le zinc peut se dissoudre dans le gaz hydrogène ; mais il est probable que ce qu'on a pris pour du zinc était de l'arsenic ; car même le zinc distillé peut contenir une petite quantité de ce dernier métal.—*Traité de Chimie, par Berzelius, Bruxelles*, 1839.

In the next experiment some oxide of tin, free from the slightest trace of iron, was introduced into a long, hard glass tube, and the latter heated to redness. Hydrogen gas, prepared as already described, was passed through a desiccating apparatus, and then conducted into the heated tube. The operation was continued until the greater portion of the oxide of tin was decomposed. The surface of the oxide of tin was so great, and the gas so slowly evolved, that none of the latter escaped from the exit end of the tube; nothing but steam passed off. The reduced metal and the undecomposed oxide were next removed from the tube, and, having been dissolved, were found, on the application of appropriate tests, to be perfectly free from iron.

Experiments, similar to those above described, were made with pure zinc, and were attended with like results.

I do not pretend to affirm that I have proved the utter impossibility of producing gaseous combinations of hydrogen with iron and zinc ; but allowing that they may exist, that they are never formed during the dissolution of the metals or acids, may be reasonably inferred from the results of the experiments just detailed. Indeed, I entertain doubts as to the possibility of forming such compounds—composed as they would be respectively of two highly electro-positive elements—by any process. All my attempts to combine hydrogen with iron and with zinc—and they have been numerous—resulted in failures. The combinations cannot be brought about by the action of steam, or of sulphuretted hydrogen on the alloy of sodium and iron, and that of sodium and zinc ; yet, here the hydrogen and the metal are mutually presented in the nascent state, a condition the most favourable for combination. We know how readily the metals arsenic and antimony combine with hydrogen, when the latter alone is presented in the nascent state.—*Dublin Hospital Gazette.*

NOTE ON SOME VEGETABLE COLOURING MATTERS.

BY M. FILHOL.

Chemists and botanists have repeatedly investigated the nature of the matters which give to the corollas of flowers their brilliant and varied tints. Robert Boyle, Humboldt, Marquart, Berzelius, Macaire, Pruisep, Schübler and Franck, De Candolle, M. Caventou, Robiquet and Chevreul, M. Hope, M. Hugo Mohl, Mulder, M. Morot, MM. Frémy and Cloez, have successively published on this subject works of the highest interest.

It would take too long to recal here the part which each of the above-named distinguished men has taken in the development of this department of science. I shall content myself by saying, that notwithstanding the high value of the researches which they have severally made, some points in the history of vegetable colouring matters still remain obscure and demand new investigations. I will, in a very short summary, make known the facts which I have observed, and in order to render them clearer, I will devote a special article to each kind of colouring matter.

White Flowers.—There are no flowers of a pure white existing. The celebrated painter Redout noticed this a long time since. Flowers which appear to us white have nearly always a light-yellow, rose-coloured, or blue tint. All these flowers become of a fine yellow when dipped in ammonia. Acids restore their primitive colour. Ether removes from white flowers a substance which possesses the following properties :—

It is solid; of a clear yellow colour; soluble in water, in alcohol, and in ether; it is uncrystallizable; pure chlorohydric acid communicates a pure deep yellow very vivid colour to it, which disappears upon the addition of water. Alkalies also colour it yellow. This matter furnishes very beautiful lake colours with metallic oxides, and can be used for dyeing fabrics of a bright and very durable yellow. Its presence in flowers has been noticed by several authors, and especially by M. Hope, who has given it the name of *xanthogene.* No one had isolated it and pointed out its remarkable analogy with *luteoline.*

Red, Rose-coloured, and Blue Flowers.—All chemists agree in admitting that red, rose-coloured, or blue flowers owe their colour to the same proximate principle, which will be blue in flowers with a neutral juice, and red or rose-coloured in those

where the juice is acid. This proximate principle has received several names, which I shall not repeat here. MM. Frémy and Cloez have called it *cyanine.*

Cyanine is solid, uncrystallizable, and analogous to an extractive matter ; it is soluble in water and in alcohol, and insoluble in ether ; alkalies communicate to it a green tint. According to M. Morot, it contains nitrogen as one of its constituents.

The result of my researches is, that cyanine becomes blue, and not green, under the action of alkalies, and that the green tint which we observe when we treat a red or blue flower by a salt with an alkaline reaction, is owing to the xanthogene which is found with cyanine in nearly all flowers becoming yellow at the moment that the latter becomes blue.

The mixture of yellow and blue forms the green. Cyanine does not contain nitrogen as supposed by M. Morot ; it is identical with the matter which M. Glénard has described under the name of *œnocyanine*, and which he had obtained from wine. I shall show farther on that it exists with other colouring matters which are found both in the flowers and fruits.

Some red flowers do not contain xanthogene, thus these become of a pure blue or beautiful violet colour in contact with ammonia. I shall quote, among others, those of the red corn poppy.

Cyanine often exists in the young shoots of plants, and it is there sometimes accompanied by matters which are more especially found in flowers. It is thus that the young shoots of the roses of Bengal, which are coloured red, are odoriferous and sugary like the flowers themselves. The sugar and the volatile oil which gives the odour, disappear along with the cyanine in the progress of vegetation.

Some plants with red or rose-coloured flowers do not contain cyanine. I will cite the aloes, the flowers of which contain a colouring matter very analogous to *carthamine*, and perhaps identical with it.

Yellow Flowers.—Chemists who have investigated yellow flowers have discovered in them two distinct substances, which they have designated under the respective names of *xanthine* and *xantheme*. These have been examined by MM. Frémy and Cloez ; I shall refer to their Memoir for details as to their properties, and I shall only describe here my own observations. The result of my researches is, that xanthine assumes under the influence of concentrated chlorohydric acid a green colour resembling that of chlorophyll. This colour changes to a nearly pure blue when we add to the solution some drops of nitric acid. When this liquid is agitated with ether, we divide it into two parts—one a yellow matter soluble in ether, and another of a pure blue colour which remains in the alcoholic liquor.

Xanthine is found abundantly in some fruits, and especially in those of the Cucurbitaceous family.

Some yellow flowers contain a colouring principle which is neither xanthine nor xantheme. This is found in a pure state in the flowers of *Crocus luteus*, we find it also in the stigmas of the officinal saffron, where it is associated with some other colouring matters. It exists also in the stigmas of *Crocus multifidus ;* lastly, I have found it at the base of the ovary of the plant known under the name of *Fabiana.* I shall designate it *crocoxanthine*, a name which recals its existence in all the species of the genus Crocus.

This matter is solid, uncrystallizable, of a beautiful golden yellow colour ; it is neither altered by acids nor bases, by which it is distinguished from xanthine, xantheme, and xanthogene. Crocoxanthine is soluble in water and alcohol, and insoluble in ether ; it produces with some metallic oxides beautiful lake colours ; it can be fixed upon fabrics ; its dyeing power is remarkable.

Green colouring matter of Leaves.—If we compare the properties of xanthine which I have noticed above along with those that M. Frémy has recently attributed to chlorophyll, we are struck with the extreme analogy which these two colouring matters present, and are hence led to think that the blue colouring matter which M. Frémy believes he has isolated from chlorophyll does not pre-exist there, but that it has been produced by the alteration of the primitive colouring matter. The following facts show that such is probable:—

When we add to an alcoholic solution of chlorophyll some drops of pure chlorohydric acid, it loses its beautiful green colour and becomes yellowish brown. If we then add to it an excess of acid, the green colour reappears, but with a blue tint

different from the primitive colour. If we add to the liquid some drops of nitric acid, it becomes of a nearly pure blue colour. The same changes take place with it, therefore, as with xanthine.

Preservation of Fresh Flowers.—We may preserve many flowers for a long time in a fresh state by enclosing them in sealed tubes. At the end of some days all the oxygen of the air confined in the tube will have disappeared and become replaced by carbonic acid.

If we introduce into the tubes a little quick lime, it removes from the flowers some of their humidity, which facilitates their preservation. Lime also takes up the carbonic acid, and the plant becomes placed in pure nitrogen.

All flowers are not alike preserved by this process; yellow flowers are those which are altered the least.

It would be very easy for botanists to forward thus fresh flowers upon which they could verify characters difficult to observe upon dried specimens.

I have placed before the Academy some flowers which have been preserved several months, and of which the colours are not sensibly altered.—*Journal de Pharmacie et de Chimie.*

THE SPONGE FISHERY OF THE OTTOMAN ARCHIPELAGO.

BY P. L. SIMMONDS, F.S.S.

The principal article of export from the Ottoman Archipelago is sponge. Within the last few years the number of boats employed in the fishery has increased a third, while the number of men has nearly doubled. Average number of boats employed by each island in the sponge fishery:—

Islands.	Formerly.	In 1858.
Calymnos	120	254
Symi	120	190
Halki	60	65
Castel Rosso	40	40
Leros	30	30
Stampalia	10	12
Telos	—	7
Cassos	—	2
Total	380	600

As there are seven men to each boat, the number of men employed now is 4200, against 2960 formerly. Of the 600 boats employed in 1858, 70 fished on the coasts of Rhodes, 150 on the coasts of Candia, 180 on the coasts of Syria, and 200 on the coasts of Barbary.

The island of Calymnos is the chief of the sponge-fishing islands in the Ottoman Archipelago. The sponge-fishing grounds are on the coast of Candia, Syria, and Barbary. The average depth at which sponges are found is thirty fathoms; those of an inferior quality are found at lesser depths. The sponge-fishing boats in the island of Calymnos amount to 260, employing 1600 men and boys. These boats, called scafi, are on an average six tons each, carrying from six to seven, and sometimes eight men, of whom two are rowers.

The proceeds of the sponge are divided into shares, the divers receiving a whole share, and the rowers two-thirds of a share. The diver, who goes head-foremost into the water, takes with him a triangular-shaped stone, to which a strong line is tied to a hole in one of its corners, to assist him in his descent, and to direct him, like a rudder, to any particular spot.

On reaching the bottom, he tears off a number of sponges from the rock, gives a pull at the line, when he and the sponges in his arms are drawn up by the rowers. A good diver will make from eight to ten dives during the day.

The sponge is covered with a thin, tough, black cuticle, inside of which there is a white liquid like milk, and of the same consistence. The sponge in this state presents a very different appearance to what it does when freed from these extraneous substances. The annual value of the sponges taken by the Calymniotes

amounts to about £25,000. The finest are sent to Great Britain, the common and coarser to France, Austria, and Constantinople.

There are nineteen boats, employing 120 divers, engaged in the fishery from Castel Rosso. But the sponge-fishery there is declining, as the natives find it more profitable to engage themselves as seamen in the regular trading vessels. The amount derived from sponges is calculated at about £2500 a year, the half of what it was a few years ago.

The only article of export from the island of Astropalia is sponge, to the value of about £1500 a year. There are twelve sponge-fishing boats, with 100 divers. During the months of May to September, only very old men, women, and children, are to be found on the island of Symi. All the able-bodied part of the male population being at this season at the sponge-fishery. 190 boats are employed in it, with nearly 1500 men. The merchants of the island usually go themselves to Marseilles, or Trieste, in their own vessels, of which they now possess eighteen, of from 100 to 300 tons, to sell the sponges fished by their countrymen, to the value of about £15,000 a year; bringing back from those places various articles, part of which they send to the neighbouring islands.

The sponge-fishing on the coast of Latakia is carried on during three or four months, according to the weather. A small fleet of sponge fishing-boats, of from fifteen to twenty tons, manned each by six or ten hands, including the divers, are daily occupied in this severe but successful commercial pursuit.

Sponges exported from the port of Rhodes:—

Quality.	1856.		1857.	
	Quantity.	Value.	Quantity.	Value.
	cwts.	£	cwts.	£
Fine	302	34,872	294	51,282
Common	1100	25,385	1195	24,974
Coarse	333	4,487	393	479

The sponge-fishery on the coasts of Rhodes, which had gradually diminished to a few boats, was actively resumed in 1858, seventy boats having gone there for the purpose, when the Governor-General immediately established a duty of twenty per cent. on all sponges taken on the coast; but, upon the divers threatening to go elsewhere, the duty was commuted for a fixed sum of £3 on each boat.

A duty of twenty per cent. is levied on all sponges taken on the coasts of Candia; but the divers are gradually leaving that island for the coasts of Barbary, where no duty is exacted, although their boats have to be carried there in vessels, and brought back in them to their respective islands, at a great expense; whereas, they could proceed to Candia in their boats themselves. It is not so much of the duty itself that these poor people complain, as of its irregular and rapacious manner of exaction.

The inhabitants of the island of Halki, who are active, hardy, and enterprising, occupy themselves almost entirely in the sponge-fishery, which has doubled within the last ten years. They send out annually sixty boats to it, manned with 450 divers. The export of sponges is calculated to reach about £8000 annually. They pay an export duty of one per cent. The Tiliotes (island of Piskopi), who only began a few years ago to fish for sponges, have already four boats for the purpose, with thirty divers. From the active, enterprising character of these people, there is no doubt that this branch of commerce will increase.

About 9000 okes of fine sponges are annually exported to Great Britain from the different islands. The sponges are of three qualities; namely, fine, common, and coarse. In the fine sponges there is but one in ten of the first or superior quality; the rest are of a second or inferior fine quality. In the common sponges there is one in four of a first quality; the rest are of a second common quality. In the

coarse, one-half are of a first quality, and the other half of a second coarse quality. Thus it will be seen that the fine, common, and coarse kinds of sponges may be divided into two qualities each. Formerly the divers used to sell their sponges by weight, to increase which they put sand in them, a practice which they still continue, though now sold by quantity.

The following are the market prices, and the values, in round numbers, of the sponges sold during five years:—

	Prices per Oke of 2¾ lb.			Value of each Quality sold.			
	Fine.	Common.	Coarse.	Fine.	Common.	Coarse.	Total.
	Piastres.	Piastres.	Piastres.	£	£	£	£
1854.....	200	40	28	30,000	20,000	4000	54,000
1855.....	220	40	40	33,000	22,000	5000	60,000
1856.....	300	60	35	35,000	25,500	4500	65,000
1857..... ..	300	65	35	51,000	25,000	5000	81,000
858.....	325	100	30	35,000	50,000	5000	90,000

Of the sponges purchased in these islands, about two-thirds of the fine, one-quarter of the common, and one-quarter of the coarse (all of the first qualities), are sent to London; half of the best common quality to France (none of the other qualities are imported to that country); one-eighth of the fine, and one-eighth of the common, and many of the coarse (all second quality), to Trieste. The refuse of the fine, common, and coarse sponges are sent to Constantinople. Lately, a few good fine sponges have been sent to the United States of America.

The prices of the fine sponges were from twenty-five to thirty per cent., and those of the common thirty to thirty-five per cent. dearer in 1858 than in former years. This increase was owing to the competition of the many European sponge merchants, who had come there latterly, in person, to make their purchases.* 2745 cases and sacks of sponge, valued at 4,105,600 piastres, were shipped from Smyrna in 1857.

The fisheries of the Gulf of Volo (Thessaly) form a source of local wealth. Sponges of the best quality are annually taken to the value of £2000.

The following figures from the official returns show the total quantities and value of Turkey sponge imported during six years. It is received principally through the four channels of France, Greece, Turkey Proper, and Austrian Italy, and sometimes from Malta and Egypt. We shall take another opportunity to speak of the more common Bahamas and American sponge. It may be added that the average computed or official value is no fair criterion of price. There has, however, been a steady advance in price of late years. In 1854 the computed or official value was 6*s.* 3*d.* per pound; in 1858, 11*s.* 3*d.*; but the selling price of the best is 21*s.* per pound.

Imports of sponge into the United Kingdom:—

	Quantity lbs.	Value £.
1853	205,924	
1854	224,787	70,246
1855	329,985	140,164
1856	313,287	172,308
1857	318,676	164,650
1858	287,681	157,751

—*The Technologist.*

ON THE ALLEGED PRACTICE OF ARSENIC EATING IN STYRIA.

A PAPER was read on the above subject, at a meeting of the Literary and Philosophical Society of Manchester, on the 30th of October last, by Dr. H. E. ROSCOE, of which the following abstract is taken from the proceedings of the Society:—

"Professor Roscoe being anxious to obtain further definite information respecting

* Report of Mr. Campbell, British Consul at Rhodes.

the extraordinary statements of Von Tschudi, quoted by Johnston in his "*Chemistry of Common Life*," that persons in Styria are in the habit of regularly taking doses of arsenious acid, varying in quantity from 2 to 5 grains daily, was supplied through the kindness of his friend Professor Pebal, of Lemberg, with a series of letters written by seventeen medical men of Styria, to the government medical inspector at Grätz, concerning the alleged practice. After reviewing the opinions of Dr. Taylor, Mr. Desteven, and Mr. Heisch, upon the subject, and having mentioned the results and conclusions arrived at by those who had previously interested themselves with the subject, Mr. Roscoe stated that all the letters received from the medical men in Styria agree in acknowledging the general prevalence of a belief that certain persons are in the habit of continually taking arsenic in quantities usually supposed sufficient to produce death. Many of the reporting medical men had no experience of the practice; others describe certain cases of arsenic eating which have not come under their personal notice, but which they have been told of by trustworthy people whose names are given; whilst others, again, report upon cases which they themselves have observed. Professor Roscoe proceeded to bring forward, in the first place, evidence bearing upon the question,—Is or is not arsenious acid, or arsenic in any other form, well known to, and distributed amongst the people of Styria? He said that he had received 6 grms. of a white substance forwarded by Professor Gottlieb, in Grätz, accompanied by a certificate from the district judge of Knittefeld, in Styria, stating that this substance was brought to him by a peasant woman who told him that she had seen her farm-labourer eating it, and that she gave it up to justice to put a stop to so evil a practice. An accurate chemical analysis showed that the substance was pure arsenious acid. Extracts from many of the reports of the medical men were then read, all stating that arsenious acid, called "Hidrach" by the Styrian peasants, is well known and widely distributed in that country. The second question to which Mr. Roscoe sought to obtain an answer was, whether arsenic is or is not regularly taken by persons in Styria in quantities usually supposed to produce immediate death? The most narrowly examined, and therefore the most interesting case of arsenic eating, is one recorded by Dr. Scäfer. In presence of Dr. Knappe, of Oberzehring, a man thirty years of age and in robust health, eat, on the 22nd February, 1860, a piece of arsenious acid weighing 4½ grains; and, on the 23rd, another piece weighing 5½ grains. His urine was carefully examined and shown to contain arsenic; on the 24th he went away in his usual health. He informed Dr. Knappe that he was in the habit of taking the above quantities three or four times each week. A number of other cases, witnessed by the medical men themselves, of persons eating arsenic, were then detailed. Dr. Holler, of Hartberg, says that he and other persons, named in his report, guarantee that they are together acquainted with forty persons who eat arsenic; and Dr. Forcher, of Grätz, gives a list of eleven people in his neighbourhood who indulge in the practice. Professor Roscoe did not think it necessary to translate the report *in extenso*; he gave extracts containing the portions immediately bearing upon the two questions at issue, and deposited authentic copies of the original reports with the Society, for the purpose of reference. He concluded that decisive evidence had, in his opinion, been brought forward, not only to prove that arsenic is well known and widely distributed in Styria, but that it is likewise regularly eaten, for what purpose he did not at the moment investigate, in quantities usually considered sufficient to produce immediate death.

"In the course of the conversation, after the paper was read, Dr. Clay mentioned instances in which large quantities of arsenic had been prescribed for various diseases with benefit. It was a valuable medicine, but if taken for other purposes it would produce most pernicious effects. It was a practice in some parts of the country to give it to horses to improve the sleekness of their coats.

"Mr. Ransome confirmed the observation of Dr. Clay, and stated that he had long ago drawn the attention of the Society to the fact that sulphuric acid manufactured from arsenical pyrites contained arsenic, and that this acid being employed in the manufacture of various articles used as medicine, and even as food, these likewise contained the poisonous ingredient. He had found it even in flowers of sulphur.

"Mr. Pochin and Mr. Hunt remarked that the effects of breathing the vapour of arsenious acid produced in the smelting of ores were not so injurious as might be

expected; occasionally, however, the workmen had to be taken off the particular work for a short time, until the poisonous effect which manifested itself by eruptions on the face had disappeared."

NOTES ON THE BOTANY OF CEYLON.

(*From Sir J. Emerson Tennent's work on Ceylon, 5th edition*, 1860.)

The Kumbuk of the Singhalese (called by the Tamils, maratha-maram), *Pentaptera tomentosa* (Roxb.), is one of the noblest and most widely distributed trees on the island; it delights in the banks of rivers and moist borders of tanks and canals. A venerable specimen of this species, which grows at Mutwal, towers to so great a height above the surrounding forests of coco-nut palms, that it serves as a landmark for the boatmen, and is discernible more than twenty miles distant. The circumference of its stem is forty-five feet close to the earth, and seven yards at twelve feet above the ground. The timber is durable, and is applied to the carving of idols, and for other purposes, but is chiefly prized for the bark, which is sold as a medicine, and in addition to yielding a black dye, it is so charged with calcareous matter, that its ashes, when burnt, afford a substitute for the lime that the natives chew with their betel.

The Goda-Kadura, or *Strychnos nux-vomica*, is abundant, and has obtained an European celebrity from the fact of its producing the seed from which strychnine is obtained. Its fruit, which it exhibits in great profusion, is of the size and colour of a small orange, within which a pulpy substance envelopes the seeds that form the nux-vomica of commerce. It is singular that in this genus there should be found two plants, the seeds of one* being not only harmless but wholesome, and that of the other the most formidable of known poisons. Amongst the Malabar immigrants there is a belief that the seeds of the goda-kadura, if habitually taken, will act as a prophylactic against the venom of the cobra de capello; and it is said that the coolies coming from the coast of India accustom themselves to eat a single seed per day in order to acquire the desired protection from the effects of this serpent's bite. In India, the distillers of arrack from the juice of the coco-nut palm are said, by Roxburgh, to introduce the seeds of the strychnos, in order to increase the intoxicating power of the spirit.

The Euphorbia.—In these forests the Euphorbia (*E. antiquorum*), which we are accustomed to see only as a cactus-like greenhouse plant, attains the size and strength of a small timber-tree; its quadrangular stem becomes circular and woody, and its square fleshy shoots take the form of branches, or rise with a rounded top to the height of thirty feet. Amongst the remarkable plants of Ceylon there is one concerning which a singular error has been perpetuated in botanical works from the time of Paul Hermann, who first described it in 1687, to the present, the *Kiri anguna* (*Gymnema lactiferum*), evidently a form of the *G. sylvestre*, to which has been given the name of the *Ceylon Cow-tree;* and it is asserted that the natives drink its juice as we do milk. Loudon (*Ency. of Plants*, p. 197) says, "The milk of the *G. lactiferum* is used instead of the vaccine ichor, and the leaves are employed in sauces in the room of cream." And Lindley, in his *Vegetable Kingdom*, in speaking of the Asclepiads, says, "The cow-plant of Ceylon, 'Kiri-anguna,' yields a milk of which the Singhalese make use for food, and its leaves are also used when boiled." This error is repeated in the *English Cyclopædia* of Charles Knight, published so lately as 1854; but it is altogether a mistake. The Ceylon plant, like many others, has acquired its epithet of *Kiri*, not from the juices being susceptible of being used as a substitute for milk, but simply from its resemblance to it in colour and consistency. It is a creeper, found on the southern and western coasts, and used medicinally by the

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* The *tettan-kottia*, when applied by the natives to clarify muddy water, is the seed of another species of Strychnos, *S. potatorum*. This bean is rubbed round the inside of the unglazed earthen chatty in which the muddy water is held, till about one-half of the seed is ground off, which, mingling with the water, it forms a delicate mucilage. In the course of a few minutes the impure particles, being seized by this, descend and form an apparently viscid sediment at the bottom, whilst the clearer fluid remains at the top, and although not altogether bright, it is sufficiently pure for ordinary purposes.

natives, but never as an article of food. The leaves, when chopped and boiled, are administered to nurses by native practitioners, and are supposed to increase the secretion of milk.

The Palms.—This family of trees, from their singularity as well as their beauty, most attract the eye of the traveller in the forests of Ceylon; they occur in rich profusion, although of upwards of 600 species which are found in other countries, not more than ten or twelve are indigenous to the island. At the head of these is the coco-nut, every particle of whose substance, stem, leaves, and fruit, the Singhalese turn to so many accounts. The following are only a few of the uses of this invaluable tree:—The *leaves* for roofing, for mats, for baskets, torches or chules, fuel, brooms, fodder for cattle, manure. The *stem of the leaf*, for fences, for pingoes (or yokes) for carrying burdens on the shoulders, for fishing-rods, and innumerable domestic utensils. The *cabbage*, or cluster of unexpanded leaves, for pickles and preserves. The *sap*, for toddy, for distilling arrack, and for making vinegar and sugar. The *unformed nut*, for medicine and sweetmeats. The *young nut* and its milk, for drinking, for dessert; the *green husk*, for preserves. The *nut*, for eating, for curry, for milk, for cooking. The *oil*, for rheumatism, for anointing the hair, for soap, for candles, for light; and the *poonak*, or refuse of the nut after expressing the oil, for cattle and poultry. The *shell of the nut*, for drinking cups, charcoal, tooth powder, spoons, medicine, hookahs, beads, bottles, and knife-handles. The *coir*, or fibre which envelopes the shell within the outer husk, for mattresses, cushions, ropes, cordage, canvas, fishing-nets, fuel, brushes, oakum, and floor mats. The *trunk*, for rafters, laths, railing, boats, furniture, firewood: and when very young, the first shoots, or cabbage, as a vegetable for the table.

The Talpat or Talipat (*Corypha umbraculifera*).—The stem of this majestic palm sometimes attains the height of 100 feet, and each of its enormous fan-like leaves, when laid upon the ground, will form a semicircle of sixteen feet in diameter, and cover an area of nearly 200 superficial feet. The tree flowers but once, and dies, and the natives assert that the bursting of the spadix is accompanied by a loud explosion. The leaves alone are converted to purposes of utility. The most interesting use to which they are applied is as a substitute for paper, both for books and for ordinary purposes. In the preparation of *olas*, which is the term applied to them when so employed, the leaves are taken whilst still tender, and, after separating the central ribs, they are cut into strips, and boiled in spring water. They are dried, first in the shade, and afterwards in the sun, then made into rolls and kept in store, or sent to the market for sale. In order to render them fit for writing on, they are subjected to a second process, called *madema*. A smooth plank of areca-palm is tied horizontally between two trees, each ola is then damped, and a weight being attached to one end of it, it is drawn backwards and forwards across the edge of the wood, till the surface becomes polished. The smoothing of a single ola occupies fifteen to twenty minutes.

The Areca Palm (*A. catechu*).—This palm is the invariable feature of a native garden. Of all the tribe it is the most graceful and delicate, rising to the height of forty or fifty feet, without an inequality in its thin, polished stem, which is bright green towards the top, sustaining a crown of feathery foliage, in the midst of which are clustered the astringent nuts for whose sake it is carefully tended. The chewing of these nuts with lime and the leaf of the betel-pepper supplies to the people of Ceylon the same enjoyment which tobacco affords to the inhabitants of other countries; but its use is, if possible, more offensive, as the three articles, when combined, colour the saliva of so deep a red that the lips and teeth appear as if covered with blood; yet in this practice the native of Ceylon is unconsciously applying a specific to correct the defective qualities of his daily food. Never eating flesh meat by any chance, seldom or never using milk, butter, poultry, or eggs, and tasting fish but occasionally, the non-azotized elements abound in every article he consumes, with the exception of the bread-fruit, the jak, and some varieties of beans. In his indolent and feeble stomach, these are liable to degenerate into flatulent and acrid products; but apparently by instinct, the whole population have adopted a simple prophylactic. Every Singhalese carries in his waistcloth an ornamented box of silver or brass, according to his means, enclosing a smaller one to hold a portion of chunam (lime obtained by the

calcination of shells), whilst the larger contains the nuts of the areca and a few freshly-gathered leaves of the betel-vine. As inclination or habit impels, he scrapes down the nut, which abounds in catechu, and rolling it up with a little of the lime in a leaf, the whole is chewed, and finally swallowed, after provoking an extreme salivation.

MISCELLANEA.

Steadine, a Substitute for Hog's Lard.—Steadine is but a contraction of the word stearaïdine, resembling fat, and is prepared as follows:—

Lard .....3½ oz.
Water .....3½ oz.
Soda deprived of its carbonic acid by lime, 15 grains.

The soda is weighed and used dry. It should be melted in about four drachms of water; the lard is then gradually added alternately with the remaining water. The operation of this mixture is both swift and simple; in ten minutes four pounds of steadine may be prepared. This new adipose substance presents the appearance of a whitish fatty compound, inodorous, insipid, and intermediate between cerate and lard. Its consistency, soft at first, soon acquires more firmness: it is not, like axunge, liable to liquefy during warm and to harden in cold weather. It indefinitely preserves its colour and density, unless left constantly exposed to the atmosphere—a practice injurious to other pomades and fatty matters, which turn rancid from prolonged contact with the oxygen of the air.

The slight addition of the alkaline ingredient is undiscoverable from taste or from examination with test-paper, being entirely saturated by the fatty excipient. It suffices, however, to create a new fatty substance of a mixed nature, a medium between fats and bodies soluble in water. A new and solid species of glycerine is thus produced, which is to a certain extent soluble in oils and water. This double property renders it capable of being in the preparation and use of pomades as serviceable as glycerine itself for oils and liniments. Ointments containing metallic bases, oxides, chlorides, sulphurets, iodides, salts, &c., remain unaltered, the iodide of potassium pomade preserves its whiteness, and does not lose its iodine. For the purpose of manipulation, it will be found most convenient. Insoluble powders mix with it promptly and with great accuracy. It is more readily combined with vegetable powders than lard, a bad solvent of their active principles. Soluble salts, extracts which require previous dilution in water, can be immediately and completely associated with steadine, whereas, when hog's lard is used, the repulsion between the ingredients is so great that a very protracted and persevering manipulation is necessary before even a badly assorted union can be effected.—*Journal of Practical Medicine and Surgery.*

Safety of Steam Boilers.—A contrivance for preventing steam boiler explosions, for which a patent is about to be taken out, is described in the *Macclesfield Gazette.* The arrangements are entirely beyond the control of the engineer, being inside the boiler, without at the same time rendering it necessary to forego any additional security that may arise from the ordinary safety valve and alarm whistle. In the case of over-pressure of steam an internal valve in the boiler is opened, and the steam escapes into the fire, not blowing it out suddenly, but diminishing its force gradually, and in such a way that if the engineer should attempt to prevent the intensity of the heat from diminishing, he would only increase the effect both by exposing the fuel more to the action of the steam, or by otherwise increasing the extinguishing power. As the fire in this case is not put out, no loss of time arises from the temporary discharge of steam into it. The operation of the contrivance for preventing accidents from the water getting too low is of a similar nature; but in this case water is discharged into the furnace and the fire is put out. If the safety valve is overweighted and the warning of the whistle prevented or neglected, the contrivance against over-pressure immediately operates, and cannot be tampered with from without; and the provision against accident from want of water is from the same cause equally beyond the engineer's reach. The gauge is set by the owner of the engine or some competent person, so that the jet of steam shall be discharged into the fire when the pressure of the steam boiler reaches a certain weight; and so

that the escape of water may put out the fire when the water has fallen to a certain depth in the boiler. After the gauge is so fixed the engineer cannot alter it; and when the pressure and depth of water have reached the points fixed nothing can prevent the consequences which we have described from following. The cost of the apparatus does not exceed £5 or £6. It has been in operation for nearly twelve months in the silk factory of Mr. E. H. Higginbotham.

A Column of Coal.—The mineral resources of the Lower Province of British North America will, to some extent, be represented in the Exhibition of Canadian Art and Industry. Of the specimens the most remarkable is a section of the entire thickness of the main coal seam of the Albion Mines, Picton, one of the greatest deposits of fossil fuel in the world, and at present yielding about 100,000 tons annually. The specimen, when set up, will constitute a column of coal 2 feet in diameter and 37½ feet in height, this being the entire thickness of the immense extent and value of the coal deposits of British America. The specimen is contributed by Mr. James Scott, superintendent of the mine. Among other specimens from Nova Scotia is a block of "oil coal" from the Fraser Mine.—*Canadian News.*

A New Material for the Manufacture of Paper.—M. de Paravey, in a recent communication to the Academy of Sciences, at Paris, called the attention of the members to a plant, from which an excellent kind of paper is procured in Upper Scinde, and to the north of the Himalaya mountains. This material is much used in Thibet, and amongst the native bankers of India, and its employment is referred to by Moorcroft and other travellers; when it has become soiled or written upon, it can be made up again and rebleached. The plant in question is the *Ruscus aculeatus*, commonly known in this country as Butchers' Broom, and may be met with in considerable quantity in most woody districts.—*London Medical Review.*

Iodine in Rain Water.—M. Chatin, alluding to the experiments by which M. de Luca, professor of chemistry at Pisa, has endeavoured to show that the rain water which falls there does not contain iodine, informed the Paris Academy of Sciences that he had not only found that element in the rain water of Pisa, but also in that of Florence and Lucca, and that all he could say in mitigation was, that in those parts rain water contained much less iodine than at Paris. He further stated, in reply to the objection made to his tests, that he had found iodine both in distilled water and in potassium taken at the best laboratories, and apparently perfectly brilliant. He admitted that he was unable to obtain the iodine in its natural state from the water which contained it, but, on the other hand, he announced that he had extracted it from two aquatic plants—viz. the *nasturtium officinale* and the *ceratophyllum demersum*—a fact which showed that the water in which they grew must have contained some.

A New Filter.—Professor Malapert, of Poitiers, places in the midst of his filters, in the pulp of the paper, a disc of cloth which increases its solidity. The operation of filtering is slower but more sure. The new filter is approved by the Society of Pharmacy of Paris, and is considered to fulfil all the conditions required for delicate chemical experiments. It contains no lime or iron, and only a trace of chlorine.

Amalgam for Stopping Teeth.—An alloy for this purpose is recommended to be made with two parts of silver and one part of cadmium, which is said to be perfectly malleable and very hard; with equal parts of each it is also malleable, but possesses less tenacity.

Inhalation of Chloroform.—A paper by Dr. Jeaucourt has been read before the Paris Academy of Sciences, on the employment of chloroform, in which the author states that whenever the act of breathing is continued regularly during inhalation, chloroformization presents no danger, but that when this continuity is interrupted, either by the fault of the operator or the patient, there may be danger. Hence he establishes the general maxim, that to avoid all accidents in producing anæsthesia, great care must be taken to cause an incessant renewal of the air contained in the lungs until the sleep has begun. If, until then, breathing has been constantly going on regularly, it will continue without interruption.

Admixture of Hemlock with Aniseed.—A communication has been made by

the Dutch Government of the existence of a quantity of hemlock in the aniseed imported into Holland from Leghorn, in some cases in the proportion of even one third of the weight. Several cases of poisoning are stated to have occurred amongst the Dutch people, which are traced to the undue consumption of aniseed, in which the lower classes indulge. The French Government have issued a warning to merchants receiving consignments of aniseed, to examine them with great care before delivery. It is believed that this admixture is due to the fact, that in the Romagna the hemlock is left to grow wild with the aniseed, and that great carelessness is manifested in the gathering.

Poisoning Fish.—An act of barbarity and wickedness has lately been committed by some persons, who have thrown some poisonous substance into the river Southesk, which has effected a wholesale destruction of the fish. As the proprietors of the public works on the river all give the assurance that no deleterious matter could have been even accidentally discharged from their premises, it is clear the act, by whomsoever committed, must have been done designedly. The extent of the injury is so much the greater as the fish were spawning, and, if repeated, the proceeding may utterly extirpate the fish from the river. The proprietors of the salmon fishings offer £20 for the discovery of the perpetrator of the mischief. Mr. Johnston, the tracksman of the fishings, has presented a report to the proprietors, in which he states that he found thousands of trout lying dead on the ground, and estimates the damage at about £1000.

Death from an Overdose of Colchicum.—An inquest was lately held at Bristol, on the body of a woman who had died on the previous night. The husband of the deceased deposed that she suffered from rheumatism in the hands, for which she took colchicum. He told her the dose was thirty drops, and knew there was a small portion remaining in the bottle he had brought from sea, but did not know how much. On the Sunday night his wife took the bottle, and drained all that it contained, and was soon afterwards taken with sickness, which turned to bowel complaint. Mr. Omerod, surgeon, was sent for, and attended her till the Tuesday, when she died. The evidence of the surgeon was to the effect that death was caused by an overdose of tincture of colchicum. The jury returned the following verdict: "Died from taking too large a dose of tincture of colchicum without medical advice."

POISONING BY GREEN PAPER.

On Friday, the 9th of November, an inquest was held at Highbury, Islington, before Mr. Wakley, coroner, on the body of Clarence W. King, aged three years and a half. J. B. Metcalfe, Esq., M.R.C.S., stated in evidence that he was called to visit the child on Thursday morning, Nov. 1st, when he found that the little boy had been in convulsions, and was then in a semi-comatose state. He learned that the child had felt chilly, and had been sick. In the evening the symptoms seemed somewhat relieved by the remedies administered, but during the night he became worse; and his sister was also seized with convulsions, followed by dysenteric discharge from the bowels. Witness was again sent for, and on his arrival found the child first affected in a state of collapse. Thinking the appearances suspicious, the children having been previously attacked in a similar manner, he began to search for the cause, and discovered that they had, during the last few days, been playing with their toys in the cupboard of a room, which room was papered with a green flock paper; that two or three days previously they had been amusing themselves by clearing out one of the cupboards, and that the little boy had sucked a piece of lace which he had found there. Under these circumstances, the evacuations were sent to Dr. Letheby for analysis. In the mean time, every effort was made to rally the little boy, but to no purpose, and he died thirty-eight hours after the commencement of the attack. A *post-mortem* examination was made, and the viscera was forwarded to Dr. Letheby, and at the same time portions of the green paper. Dr. Letheby stated that the paper was coloured with arsenite of copper, or Scheele's green, which was so loosely attached to the surface, that it brushed off readily. The quantity of the poisonous pigment amounted to nearly-one third the weight of the paper, and therefore was highly dangerous in its nature. He had examined the stomach, and found that it contained

distinct evidences of arsenic; so also did the liver and evacuations; but the quantity of the poison in the last two was not nearly so large as that in the stomach. The coroner remarked, that he and a son had experienced headache from sitting in a room hung with such paper. The jury returned the following verdict: "That Clarence William King had been poisoned by the inhalation of arsenical fumes which had escaped from the green paper of a certain sitting-room, and that the manufacturer of such paper had been guilty of very careless and culpable conduct."

[The above verdict is not in accordance with the evidence given; the child may have died from the effects of arsenic, but certainly not "by the inhalation of arsenical fumes."—Ed.]

BOOKS RECEIVED.

The Principles of Physiology, *applied to the Preservation of Health, and to the Improvement of Physical and Mental Education.* By Andrew Combe, M.D., &c. Edited by James Coxe, M.D. Fifteenth Edition. Edinburgh: Maclachlan and Stewart. 1860.

A work that has already reached the fifteenth edition requires but little comment from us; we shall therefore only recommend those of our readers who have not hitherto perused it, to do so without delay, for nearly every page is replete with most valuable information upon the principles which should guide us in the preservation of health, and in the improvement of physical and mental education.

The Composition of the Urine, *in Health and Disease, and under the Action of Remedies.* By Edward A. Parkes, M.D., &c. &c. 8vo, pp. 400. London: John Churchill, New Burlington Street. 1860. (From the Publisher.)

TO CORRESPONDENTS.

E. M. H. (Plymouth).—(1.) Common oil of amber of commerce is distilled from refuse amber, and other resinous bodies. (2.) *Emetina* may be obtained by digesting powdered ipecacuanha root, first in ether, and then in alcohol; the addition of magnesia throws down impure emetina, which should be washed in cold water, and then redissolved in boiling alcohol, from which solution the emetina may be obtained by distillation. (3.) In making "Glycerine Soap," the glycerine is, we believe, stirred in before the mass cools. (4.) Nitrous fumes. (5.) For the process for preparing aluminium, see vol. xvi., p. 34; vol. xvii., p. 532; and vol. xviii., p. 420.

Chemicus (Manchester).—*Marine Glue.* Digest one part of india-rubber (cut small) in twelve parts of mineral naphtha in a covered vessel, with heat and agitation, and when the solution is complete, add twenty parts of powdered shellac, and continue the heat till the mass becomes liquid.

J. V. S. (Guildford).—Hooper's *Medical Dictionary*, 30*s.*

A. C. (Taunton).—(1.) Spirit of wine can only be legally sold by chemists for medicinal use. (2.) Morton's *Manual of Veterinary Pharmacy*, 10*s.* (3.) The subject is not within our province.

A. P. B. (Lewisham).—(1.) The deposit alluded to should be treated with boiling alcohol and animal charcoal. A more simple method than the one referred to, for obtaining cantharidin, is to make a strong alcoholic solution of cantharides by percolation, and leave it to evaporate spontaneously. The cantharidin which forms may be decolorized by animal charcoal, and recrystallized out of alcohol. (2.) The evaporation should be conducted slowly.

A Registered Apprentice (Manchester).—Bentley's *Manual of Botany* (Churchill), 12*s.* 6*d.*

Erratum.—In the list of Donations to the Library, in our last number, *for* "Historical Notices of Enfield, by J. Taff," *read* Historical Notices of Enfield, by J. Tuff, Chemist, M.P.S. (From the Author.)

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, Elias Bremridge, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. Churchill, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.

SECOND SERIES.

VOL. II.—No. VII.—JANUARY 1st, 1861.

THE EXAMINATIONS OF THE PHARMACEUTICAL SOCIETY.

The prosperity and success of the Pharmaceutical Society depend in a very great measure upon the way in which the provisions relating to education and examination are carried into effect, and the extent to which the results of the Society's operations in these respects are appreciated and encouraged. It is satisfactory to observe that, whenever allusion is made in the public prints to the qualifications, or rather to the want of qualification sometimes complained of, among Chemists and Druggists, exception is made in favour of the Pharmaceutical Society, as a body in which professional qualification is made the basis of membership; and the efforts of this Society to raise the standard of proficiency among its members, are freely admitted by all those acquainted with the arrangements adopted, to be calculated greatly to promote the advancement of medical science and the security and welfare of the public. It is satisfactory also to find that the certificates and diploma granted by the Society upon examination, are from year to year more eagerly sought after by those who are preparing to establish themselves as Pharmaceutical Chemists. The stringency of the examinations, which has been gradually increased as provisions for the scientific education of pupils have been extended and their influence prolonged, has not had the effect of checking the influx of candidates; on the contrary, the credit of passing a strict examination such as that of the Pharmaceutical Society now is, seems to act as an incentive to study, while the distinction conferred by the possession of a well-earned certificate of professional qualification, having the effect of a legally-recognized licence, is justly considered a sufficient recompense for the expenditure of time and money in making the necessary preparation. On the first introduction of the system, which has now been in operation for nearly twenty years, the examinations were comparatively easy, due allowance having been made for the circumstances under which pupils were then placed, as no intimation had been given that they would be required to pass an examination, and no adequate provision made for affording them systematic scientific education. Now, however, ample notice has been given, and efficient provision made for supplying the requisite knowledge. Those entering upon the study of Pharmacy know that something more than the serving of an apprenticeship is necessary—that they have something more to learn than the mere routine of shop-work—if they expect to take a good position in public estimation among the many well-educated and well-qualified Pharmaceutists of the present day.

The certificates obtained by successful candidates, when the nature of the examinations are better and more generally known, will be found to assume increased value. Complaints have frequently been made of the incompetency of many assistants and of the difficulty of getting such as are thoroughly qualified for all the duties they may be expected to perform. We know some establishments where the practice is adopted of submitting assistants, before engaging them, to a rigid examination; but this course cannot be always efficiently

adopted; and it may be reasonably supposed that a Board of Examiners selected on account of their special qualifications for the exercise of the important duties they have to perform, and each one taking a special department, would accomplish a more searching investigation of a young man's qualifications than could be generally effected under other circumstances, by an individual. In the Minor Examination, there are six distinct subjects on which the candidate is examined by separate examiners. These are:—1. *The reading and translating of Prescriptions.* 2. *Botany.* 3. *Materia Medica.* 4. *Pharmacy.* 5. *Chemistry.* 6. *Practical Dispensing.* If the candidate succeed, on each of these subjects, in reaching the standard which has been fixed, and thus satisfying the examiners, there will be little doubt of his qualification as an assistant, as far as professional knowledge is concerned. But we have heard it stated, that young men who have passed this examination have, nevertheless, turned out to be bad assistants. This may, no doubt, be the case, for there are other qualifications besides those of professional knowledge, which are required to make a good assistant. It may even be found in some instances that young men who have obtained the certificate of examination have, by the influence of that circumstance, been rendered less useful as assistants than they otherwise would have been. We believe, however, that such cases are rare exceptions, and have no doubt they will cease to exist when the practice of passing the examination has become more general, and when the qualification implied by the certificate is better understood. In our next number we hope to be enabled to publish a detailed description of the examinations, comprising the most recent arrangements of the Board of Examiners.

THE THIRD CLASS EXAMINATIONS OF THE COLLEGE OF PHYSICIANS.

In the number of this Journal for last May, we referrred to a decision which had then been recently come to by the College of Physicians of London, to create a third class of medical men connected with the College, and to be designated Licentiates of the College of Physicians. The former Licentiates of the College were to be designated Members, and the new Licentiates were intended to occupy a position, with reference to their practice, resembling that of the Apothecaries, with a restriction, however, that they should only dispense medicines for their own patients. Some opposition appears to have been offered by the Apothecaries to the adoption of this regulation, which is considered to be calculated gradually to supersede the examinations at Apothecaries' Hall. Legal opinions have been taken on the subject, the result of which is that the College, having been confirmed with regard to the legality of the proposed measure, intend forthwith to carry it into effect.

The influence of this new arrangement upon the members of the Pharmaceutical Society will probably be very great. It is a step towards a more complete separation than has hitherto existed in this country between the prescriber of medicines and the dealer in drugs. The Pharmaceutical Society are training up a class of qualified and examined men, to whom the practice of Pharmacy in all its branches may be safely entrusted, while they have no right to practice medicine; and, on the other hand, the College of Physicians are about to initiate a class of general practitioners, who, while performing the strictly medical functions of the Apothecary, will be restricted from mere trade transactions.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, *5th December*, 1860,

Present—Messrs. Bird, Bottle, Brady, Bucklee, Davenport, Deane, Evans, Hanbury, Haselden, Hills, Lescher, Meggeson, Morson, Sandford, Squire, and Waugh,

was elected a

Mr. Henry Scott Icke .....Birmingham
MEMBER.

MAJOR EXAMINATION, *18th December.*

Mohun, Martin .....Maidstone
Symes, Charles .....Thornbury
Wells, Edwin.....Ludlow

MINOR EXAMINATION.

Capner, William Morgan.....Birmingham
Cornish, William .....Brighton
Elliott, Robert .....Newcastle
Ferneley, John William.....Grantham
Fowler, Stanley.....Dover
Grindley, William.....Chester
Hustwick, Thomas Hopper .....Harrogate
Laurens, Frederick Lemprière.....Jersey
Metcalfe, John.....Preston
Sanders, Albert John .....Sandgate
Simpson, Arthur Lankester .....Stowmarket

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS.
Aplin, Benjamin D'Oyly.....	Mr. Hill.....	Norwood
Cooper, Arthur Cecil	Mr. Blandford	London
Harper, George	Mr. Deck	Cambridge
Trollop, William.....	Mr. Steward.....	Yarmouth

PHARMACEUTICAL MEETING.

Wednesday, December 5th, 1860.

MR. T. N. R. MORSON, PRESIDENT, IN THE CHAIR.

DONATIONS TO THE LIBRARY AND MUSEUM

were announced as follows:—

Reports on the Government Botanical Gardens at Ootacamund and Utakamund. Papers on the Government Botanical Gardens of Madras. General Index to Dr. Wight's Icones Plantarum Indiæ Orientalis. Memorandum upon the Panchoutee, or Indian Gutta Tree. From Dr. Cleghorn, Madras.

Revista Farmaceutica, vol. i. From the Pharmaceutical Association, Buenos Ayres.

The Chemist and Druggist. From the Editor.

The Chemical News. From the Editor.

The Photographic Journal. From the Society.

Journal of the Society of Arts. From the Society.

British Journal of Dental Science. From the Publisher.

The Proceedings of the Medico-Chirurgical Society, vol. xliii. From the Society.
Specimen of Belladonna Root. From Mr. Squire.
Inner Bark of a Tree from Brazil. From Mr. E. Clift.
A Black's Furnace, for the Laboratory. From Mr. J. C. Pooley, of Bath.

A paper was read

ON SOME OF THE APPLICATIONS OF GLYCERINE.

This subject was brought before the meeting at the suggestion of Mr. Wm. Huskisson, jun., who had received several papers from Mr. G. F. Wilson relating to the discovery, introduction, improved manufacture, and pharmaceutical applications of glycerine, which it was thought might prove interesting to the Members of the Pharmaceutical Society, although part of the matter had already been published.

Glycerine was discovered in 1789 by Scheele, as a product in the process of lead plaster making, and was called by him the sweet principle of oils. About twenty-five years afterwards it was studied by the Father of fatty chemistry, Chevreul, and shown by him to be the base of fats and fat oils. M. Chevreul lately received a specimen of glycerine obtained by our new process, with expressions of extreme pleasure. Nearly half a century has passed since the earliest of those beautiful researches into the constitution of fatty bodies in the course of which he discovered the function of glycerine, yet our specimen found him still lecturing to his class.

A source of impure glycerine has long existed in the preparation of lead plaster, in which the combination of the litharge with the acids of the olive oil sets the glycerine free; another source in soap-making, the soda or potash setting free the glycerine; and a third source in the stearic candle manufacture, where the lime saponification separates the glycerine. Most of the purifiers of glycerine appear to have preferred this last source.

Notwithstanding the known existence of these great sources of impure glycerine, it was long before glycerine was in any way utilized; hundreds of tons have been and are yearly thrown away.

The first suggestion of a use which we can trace dates in the beginning of 1844, when Mr. Thomas De la Rue, being engaged on some experiments requiring the use of syrupy substances, procured some glycerine from Mr. Warington, of Apothecaries' Hall, some of which he applied to a burn and an irritation of the skin. The experience thus obtained of its properties of soothing and keeping moist, led to its introduction, through Mr. Startin, into the Hospital for Skin Diseases, where it soon came into extensive use.

In 1846, Mr. Warington took out a patent for the use of glycerine as an agent in preserving animal and vegetable substances, and tried many experiments on preserving meat. He informs me that part of a neck of mutton preserved in glycerine for several months, when cooked by Soyer, was partaken of by a gentleman with great satisfaction.

Mr. Warington, I believe, first applied glycerine in mounting objects for the microscope, for which it has proved so successful.

In the *Lancet* of June, 1849, Mr. Thomas Wakley published the results of a year's experience in a long and very interesting paper on the Use of Glycerine in Diseases of the Ear, giving a number of cases in which it had proved a cure for deafness. In the number of the 23rd of the same month his results were confirmed by letters from Mr. Erasmus Wilson and Dr. Gardner, the latter of whom drew attention to the fact that the glycerine should be free not only from any trace of lead, but also as much as possible from water. His theory was, however, better than his practice; for the glycerine he speaks of using, sp. gr. 1.280, being above the density of anhydrous glycerine, must have been impure.

Isolated applications of glycerine had thus been suggested; but M. Cap appears to have been the first to see its extraordinary value in a great variety of medicinal preparations. His very valuable and interesting papers were published in the *Journal de Pharmacie et de Chimie*, and translated into the *Chemist*. I shall give two short extracts from them.

M. Cap, in his first paper (*Journal de Pharmacie et de Chimie*, February, 1854, *Chemist*, April, 1854), begins by attacking the process of purifying glycerine given in the French chemical books, and shows its defects. He then gives his own process, remarks upon the great value of glycerine in skin diseases, and after suggesting a number of valuable uses, proceeds as follows :—

"Glycerine dissolves the vegetable acids, the deliquescent salts, the sulphates of potassa, soda, and copper, the nitrates of potassa and silver, the alkaline chlorides, potassa, soda, baryta, strontia, bromine, iodine, and even oxide of lead. It dissolves or suspends the vegetable alkaloids in the same manner as the aqueous liquids, and at the same time the resulting products may be used for the same purposes as though mixed with oil. Thus the salts of morphia dissolve in it completely, even cold, in all proportions. Sulphate of quinine, in the proportion of $\frac{1}{10}$, dissolves in it when hot, but when cold separates into clots, which when triturated with the supernatant liquid give it the consistence of a cerate very useful for frictions and embrocations. It is the same with the salts of brucine, strychnine, veratrine, and most preparations of the same order, which enables us to consider that we have now if not medicinal oils with a vegetable alkaloid base, at least a series of new preparations which will fulfil a perfectly analogous use in therapeutics."

M. Cap, in his second paper (*Chemist*, Oct., 1854), states that he employed glycerine of 28 Beaumé, or containing 88 per cent. of anhydrous glycerine and speaks of it as a solvent of sulphuret of potassium, and sulphuret of lime, of iodine, iodide of sulphur, iodide of potassium, iodide of mercury, of some chlorides, and of quinine, and sulphate of quinine.

In the *Chemist* of February, 1855, Dr. Crawcour, of New Orleans, states that for twelve months past he had been in the habit of using glycerine very extensively in those cases requiring cod liver oil, in which the nauseous taste of the latter medicine rendered its exhibition impossible, and that now, in his practice, it had entirely superseded cod liver oil.

In a paper read at the meeting of the Royal Institution of 30th of March, 1855, by the Rev. John Barlow, F.R.S., attention was again drawn to the great preservative power of glycerine upon meat. On this occasion, Mr. Barlow showed specimens of flesh which had been immersed, some partially and some wholly in glycerine, for more than a month. I can answer for the flesh having appeared to be perfectly fresh.

M. Cap worked upon the waste liquors of soap and stearic candle works, which liquors he had first to concentrate. His process was shortly this :—he used sulphuric acid to separate the lime, and continued boiling and agitation to drive off the volatile fat acids, removing any excess of sulphuric acid by means of carbonate of lime; allowing the liquor to cool at different densities, so as to deposit sulphate of lime; and, after final concentration, treating and filtering with washed animal charcoal.

M. Cap's process, though an undoubted improvement, was not perfect, as glycerine so purified is always liable to contain more or less of salts of lime. Some glycerine, purified in our laboratory, according to M. Cap's directions, contained in addition volatile fat acids; and though the process was known in this country, specimens of the so-called "pure" glycerine, obtained from the best sources in London in 1855, contained in every case more or less impurity.

The best specimen came from Edinburgh; but even this was not absolutely

free from impurity. Some medical men appear to have been afraid to prescribe glycerine for internal use, sometimes with reason, as appears from the *Chemist* of May, 1855, where Mr. Hamilton, of Liverpool, referring to the papers of MM. Cap and Garot, and of Dr. Crawcour, stated, that no doubt the glycerine purified and used by them might be safely used internally; but that having doubts about the purity of the glycerine commonly sold as "pure glycerine," he had procured samples from several of the most respectable chemists in Liverpool, and on examination had detected lead in considerable quantity, and that the specimen in which he detected the largest quantity of lead was labelled "pure glycerine," was sold at double the price of the common glycerine, and was warranted free from lead.

I will now proceed to describe the new process for obtaining and purifying glycerine, and may remark that the road by which we arrived at pure glycerine was a rather circuitous one. Our first step was to do away with the lime process of saponification, and with it our only source of impure glycerine. By our first improvement in separating the fat acids from neutral fats, the glycerine was decomposed by the direct action of concentrated sulphuric acid at a high temperature; and all that remained of it was a charred precipitate. A new process for decomposing neutral fats by water under great pressure coming under our notice, led us to look again more closely into our old distilling processes; and the doing this showed, what we had often been on the brink of discovering, that glycerine might be distilled.

In our new process the only chemical agents employed for decomposing the neutral fat, and separating its glycerine, are steam and heat; and the only agents used in purifying the glycerine thus obtained are heat and steam: thus all trouble from earthy salts or lead is escaped.

Distillation, however, purifies the impure glycerine of the old sources.

Steam, at a temperature of from 550° to 600° Fah., is introduced into a distillatory apparatus, containing a quantity of palm oil. The fatty acids take up their equivalents of water, and the glycerine takes up its equivalent; they then distil over together. In the receiver the condensed glycerine, from its higher specific gravity, sinks below the fat acids. Sufficient steam must be supplied, and the temperature regulated, otherwise the elements of the glycerine do not take up their equivalent of water, and acroleine is evolved,—a body of a very different character, an acrid eye-inflaming vapour, appreciated only by those who have had the misfortune of an experimental acquaintance with it.

In an ordinary apparatus the glycerine distilled from the neutral fat is not in a sufficiently concentrated state for most purposes: it should therefore be concentrated, and, if discoloured, be redistilled. It is then obtained of sp. gr. 1.240, and contains 94 per cent. of anhydrous glycerine. It can be concentrated to sp. gr. 1.260, or to contain 98 per cent.

Mr. Wilson then described attempts which had been made to apply pure glycerine in some pharmaceutical preparations. Among the most important of these was its introduction into the *Mistura Ferri Composita* of the Pharmacopœia, for the purpose of preserving the protocarbonate of iron from change. In the Pharmacopœia formula, sugar is ordered, from the well-known property it possesses of arresting the conversion of the protosalts of iron into persalts. Mr. Wilson says, in experimenting with pure distilled glycerine, it was found to possess this property of sugar in a marked degree, together with another—that of dissolving the carbonate of iron immediately on its formation, yielding a deep green solution, which remains unchanged after long exposure to light and air. A concentrated *Mistura Ferri Composita*, eight times the strength of the Pharmacopœia preparation, may be made by dissolving the carbonate of potash

and protosulphate of iron in separate portions of glycerine and mixing the solutions. At the moment of mixture, the protocarbonate of iron formed is dissolved, forming a bright green solution. This may be diluted with water, and the powdered myrrh added when required. The carbonate of iron separates on dilution as a flocculent precipitate.

Glycerine was also tried as a substitute for sugar in syrup of iodide of iron, but here it did not appear to answer as well as sugar.

Among other applications that were suggested, were the following :—

Solution of ammonio-citrate of iron in glycerine, in the proportion of eight grains to the fluid drachm.

Solution of citrate of iron and quinine, in the proportion of two grains to the fluid drachm.

Solution of disulphate of quinine, two grains to the fluid drachm, no addition of acid being required.

Solution of the alkaloid quinine, in the proportion of one grain to the drachm.

Solution of tannin, eight grains to the drachm, the tannin being thus preserved from the decomposition which occurs in aqueous solutions.

It was suggested that essences of senna and rhubarb, eight times the strength of the Pharmacopœia infusions, might with advantage be made with glycerine, the latter masking the taste of the medicines, and thus facilitating their administration to children, while the absence of spirit would give an advantage to these and other similarly prepared essences over those now generally used.

Glycerine was also recommended for preparing essences of cloves, cinnamon, lemon, &c.; also for syrup of phosphate of iron, bromide of iron, and iodide of quinine. It had been found useful for preserving fresh lemon juice, and for preserving the soft consistence of pill masses and confections.

Mr. Waugh did not see much advantage in the use of the proposed concentrated *Mistura Ferri Composita*, unless it could be shown that after diluting the concentrated solution and adding the other ingredients of the mixture, it would keep better than that made in the usual way.

Mr. Hills said he had found glycerine a very good solvent of arsenious acid, which it dissolves to the extent of a drachm to a fluid ounce.

Mr. Brady said such a solution had been tried for preserving animal and vegetable substances from decay, but it was found that fungi grew in the solution very rapidly.

Mr. Haselden described the results of some experiments he had made with reference to the solvent and preservative power of glycerine. Gallic acid was freely soluble in it, so also was aloes and some resinous substances, but not the pure resin of scammony. It promoted the solution of borax in tincture of myrrh, no water being required. When added to tincture of kino, it prevented the gelatinization of the tincture, which otherwise frequently occurred. The vegetable extracts were soluble in glycerine, and some of them, such as belladonna, when thus dissolved, formed useful preparations for external application. When used as a solvent, it was often important to have the glycerine in its greatest state of concentration. He had generally employed Price's glycerine concentrated by Smith. This concentrated glycerine dissolved twice as much quinine as that which was not concentrated.

Mr. Barnes had kept iodide of iron in glycerine without change for years, by using the best concentrated glycerine.

Mr. Squire said that some time ago a preparation, called *Plasma*, consisting of glycerine and starch, was proposed as a medium for external applications, in the place of ointments. His experience of this preparation had been, that it became mouldy after being kept for some time.

EXPERIMENTS ON SPERMACETI OINTMENT AND OLIVE OIL.

BY MR. J. B. BARNES.

On the 6th of October, 1858, a paper by Mr. Richard Giles, of Clitton, was read in this room, on the preparation of spermaceti ointment. Differences of opinion were expressed ; Dr. Redwood defended the practice of using bleached olive oil in this preparation. "He stated that the specimens of olive oil in the museum of the Society were always colourless, in consequence of their being exposed to the light in a glass case, and could it be said that this oil was unfit for use? Mr. Barnes had stated, when bleached, it was more liable to become rancid. Possibly this might be the case when chemical agents were used for bleaching it, but he was not aware that it was necessarily more prone to become rancid when colourless than in the ordinary state. Indeed, there were some circumstances which would seem rather to lead to an opposite conclusion. Thus, he had observed that during the bleaching of olive oil, there was usually a deposit formed, consisting of flocculent matter, and this organic matter, if retained in solution, would be likely to promote the kind of change which occurs when the oil becomes rancid.

"The public approved of spermaceti ointment made with bleached oil, and until it could be shown that this was inferior to the other, he thought it too much to condemn the bleached oil as an unwarrantable deviation from the instructions of the Pharmacopœia."

Believing that this question could not be settled by words only, I determined upon making a few experiments, in order to ascertain which is the best preparation—that made with natural yellow olive oil, or that made with bleached olive oil. Also to discover whether olive oil, exposed to light alone, would bleach, and whether the bleaching by that agent would remove its characteristic odour and render it rancid.

On the 12th of October, 1858, I had these four specimens of spermaceti ointment prepared. No. 1 was made with *sweet* olive oil of the usual yellow colour, white wax, and spermaceti. No. 2 with *sweet* olive oil (yellow), unbleached bees' wax, and spermaceti. No. 3 with fresh olive oil, bleached by means of animal charcoal, spermaceti, and white wax. No. 4 with fresh lard, white wax, and spermaceti. The Pharmacopœia proportions were employed. These ointments have been kept loosely covered in ordinary covered pots in the shop, exposed to the usual changes of temperature.

At the end of three months I examined them, and found Nos. 3 and 4 decidedly rancid and unfit for use, whilst No. 1 and No. 2, those prepared with unbleached materials, were quite good, possessing the usual pleasant smell of good ointment. In order to ascertain how long Nos. 1 and 2 would continue good, they were set aside, and have again been examined, together with Nos. 3 and 4, after the expiration of two years.

Small quantities of each specimen, Nos. 1, 2, 3, and 4, were boiled in separate portions of distilled water. After cooling, the water was poured off from each and tested with blue litmus paper, and the following results were obtained:—Nos. 3 and 4, the bleached oil and lard preparations, instantly reddened the test paper in a most decided manner; whilst No. 1, made with unbleached olive oil, white wax, and spermaceti, showed only *a very* slight indication of the presence of an acid, and not until some moments had passed did the paper become slightly reddened. No. 2, the specimen prepared with unbleached oil, yellow wax, and spermaceti, did not exhibit the smallest indication of the presence of an acid. And, moreover, you will perceive upon smelling these ointments, that No. 1 has only the slightest possible rancid odour, and that No. 2 has not the faintest trace of rancidity; in fact, is as good

now as it was the day it was prepared; whilst Nos. 3 and 4 are most decidedly rancid and quite unfit for use as ointments.

These results have exceeded my expectations. I scarcely thought it possible that spermaceti ointment prepared with unbleached oil, would keep so perfectly good for so long a period as two years.

The ointment made with both unbleached oil and wax is undoubtedly the best; therefore, I think the Pharmacopœia Committee should recommend the employment of unbleached bees' wax in the preparation of this ointment and cerate.

It is to my mind very evident that the peculiar odour of yellow wax has a preservative action upon it, and that nature has supplied it with this principle in order that it may be better adapted for our use. So with olive oil. Its odour, I am inclined to believe, has a preservative effect upon it. We have two other familiar instances of the power of odoriferous principles in preserving fatty substances, namely, pomade divine and benzoated zinc ointment.

The next experiment was commenced on the 7th of October, 1858, and consisted in filling these two bottles with fresh olive oil from the same jar, and corking them securely. One of them, marked No. 1, was placed outside a window on the south side of my house. It has there been exposed to all the changes of temperature and the action of the sun until the present time, in order to test the power of light upon it as a bleaching agent. The result, as you see, is, that it is not bleached; it is almost as yellow as that contained in the bottle marked No. 2, which has ever since been carefully kept from the light. Therefore, it is clear that light alone will not always bleach olive oil, and I am informed that at Horner's they even occasionally meet with samples of castor oil, which will not bleach after exposure to the sun for years. This being the case, we cannot depend upon obtaining bleached olive oil which has not been oxidized, for all the processes, such as treating with animal charcoal, fuller's earth, magnesia, chlorine, &c., are processes of oxidation, and must end in rancidity.

The result of these simple experiments show us very clearly, that it is not the thing to use bleached oil and wax in the preparation of ointments. Whatever might be said to the contrary, by ingenious special pleading, the framers of the Pharmacopœia never could have intended that bleached oil should be used in the making of spermaceti ointment; and I trust those of our members who have acquired the habit of using bleached oil or lard in this preparation, will discontinue the practice, as it is most desirable that uniformity should be the rule.

December 5, 1860.

Mr. Allchin thought the reason the public generally preferred white spermaceti ointment to that which had colour was, that the former frequently contained lard in the place of olive oil; and he considered that the ointment made with the best lard was in every respect superior to that made with oil. He thought animal fat was generally more appropriate as an application to the skin than vegetable fat.

A Member said he had been accustomed to use almond oil in place of olive oil for making spermaceti ointment. A white ointment was thus produced, which kept well, and gave general satisfaction.

Mr. Deane had found almond oil in every respect unexceptionable. Spermaceti ointment was so largely used by the poor, that the cost of its production was not an unimportant consideration. At the present price of almond oil it might be substituted for olive oil without materially augmenting the cost; but in some neighbourhoods it was probably found necessary to supply the poor

with a cheaper article than could be so made, and he believed good lard formed an excellent basis for such an ointment.

Mr. Squire thought oil and wax formed one of the best simple ointments. The addition of the spermaceti was unnecessary. He did not think any objection could be taken to the use of the best white wax and pale olive oil. He believed some of the olive oil was nearly colourless when first extracted from the fruit.

Mr. Bottle thought the subject not unworthy the attention of the meeting, especially now that a new Pharmacopœia was being prepared. It was important, in reference to a preparation so extensively used, that the formula adopted should be the best that could be devised. It was also important that they should all use the same formula. He hoped the new Pharmacopœia would give a good process, that all would adhere to. With reference to the colour of the ointment when made with unbleached olive oil, this would no doubt be subject to some variation, in consequence of the oil itself differing in colour. He had observed that the oil used for salads in France was of a lighter colour than that used in this country, which appeared to confirm what had been stated by Mr. Squire. The preference manifested by the public for white spermaceti ointment might be satisfied by using a pale oil. He believed, also, that almond oil answered very well, and was a good substitute for olive oil; but any oil, the colour of which had been removed by the application of chlorine, or some compound of chlorine, was decidedly objectionable, and ought on no account to be used.

Mr. Francis did not think chlorine was ever used for bleaching olive oil, as there were other more simple and less objectionable modes of doing it. Spermaceti ointment was such a universal domestic medicine, that it was useless saying it ought not to be white, while every old woman who used it was of a different opinion. He had made it on a large scale for more than thirty years, and could speak to the decided preference given to the white ointment.

Dr. Redwood stated that, since expressing the opinion referred to by Mr. Barnes in his paper, he had made some experiments, the results of which coincided to some extent with those obtained by Mr. Barnes. The subject had also occupied the attention of the Chemical Discussion Association, and one of the members had bleached some olive oil by two different processes, one consisting in filtering it through animal charcoal, and the other in treating it with fuller's earth. These samples, together with some of the unbleached oil, had been in his (Dr. R.'s) charge for about two years, and he found that the bleached oil acquired a rancid odour sooner than the unbleached. It was only, however, after many months' keeping that any rancidity appeared. On one point he was entirely at issue with Mr. Barnes, and that was as to whether olive oil was bleached by mere exposure to light. This result always occurred in the specimens in their museum.

Professor Bentley said he could confirm the statement just made by Dr. Redwood with reference to the bleaching of the oil by mere exposure to light.

Mr. H. S. Evans, of Liverpool, said they were in the habit of bleaching olive oil in that way—by exposing it for a few months to the direct sunlight.

ON THE PROCESS OF DISPLACEMENT.

BY MR. GEORGE W. SANDFORD.

If I may trespass on the attention of the meeting with a simple matter of Pharmacy, I should like to say a word or two on displacement.

I am the more inclined to this, because I find an opinion prevails, even among those who regard displacement as the best method of obtaining tinctures, &c.,

that it is not generally appreciated by Pharmaceutists ; that, for the operations of large manufacturers, it would be impracticable ; and further (which I almost hesitate to record), that it requires more skill and attention than are usually brought to the preparation of tinctures.

It is no new system, and to me its advantages are so apparent, that I confess I feel much surprised it has not been naturalized in England as in Scotland. Looking to the Edinburgh Pharmacopœia, I find in the formulæ given for several of the extracts, and almost all the tinctures, the process of displacement recommended.

I have called it a *simple* matter: in that I refer principally to the beautiful simplicity of the process, a qualification which should at once commend it to our attention; its very name seems to suggest the most *perfect exhaustion* of the ingredients submitted to its action. We sometimes call it "*percolation*;" I much prefer "*displacement.*" Percolation, or *straining through*, may be *mere filtration*, and filtration seems hardly to imply even maceration.

It may be said, everybody knows that such is not the percolation here understood; but, having had opportunities of observing the various states of comminution into which different operators deem it necessary to bring their ingredients, I can but conclude that the very essence of *displacement* is often lost sight of in *percolation.*

Displacement is, indeed, *the absolute driving from certain cells the matter therein contained.*

In applying this process to our purposes, it is well to consider the nature of the substances with which we have to deal; they are mostly vegetable, made up, in their original condition, of *woody fibre* and liquid juices. I believe I am right in saying the hardest bit of stuff which comes into our hands owes its flavour and medicinal property to what was once a fluid; now, to obtain the article which imparts these properties, we must restore it, as far as may be, to its former condition of fluidity; this we do by saturating the substance containing it with some liquid, aqueous or spirituous, as circumstances dictate. The same thing, of course, is done in the old macerating processes of the Pharmacopœia; but, being done, the object is to remove that which we have liquefied, and here begins the advantage of displacement.

Having reduced our substance to a uniform state of coarse powder, and thoroughly saturated it with moisture, we pack it in a vessel of certain shape (in reality, a funnel) so closely that our menstruum must pass *through*, and not *round*, the particles—so evenly, that there shall be no easy channel in one part offering a freer passage than in others; and having placed a diaphragm of flannel, or filtering paper, on the surface, not only covering the ingredients, but extending up the sides of the vessel, we pour in gradually the liquid we require, and the struggle begins; not much struggle either, for, like the Chinaman in one of the Canton forts, who said to his English assailant, "*if you come in, I go out,*" the liquid occupying the mass gradually gives way to the pressure above, making its exit at the bottom.

Here you will observe is established a circulation of the menstruum through the mass of ingredients ; *it percolates every fibre, not mixing with the fluids already there, but driving them downward ;* there is mechanical action going on.

In the ordinary maceration of tinctures we find, with the frequent shakings, that our spirit dissolves the extractive matter on the surface of the slices or fragments of woods and barks, but much is left unexhausted if the shaking be omitted, or the slicing or bruising carelessly done, there being *no circulating power in the surrounding fluid—in fact, no percolation ; it is absorption.* The ingredients imprison a certain amount of the menstruum, part of which we recover by pressure, but part of which they retain, and this absorbed fluid is always found to be the *very strongest* part of the tincture.

If, on the contrary, we divide the droppings from our displacement jar into certain portions, we shall invariably find the first lot obtained to be the richest of all, and the later portions frequently almost worthless as regards extractive —a certain proof of *thorough exhaustion.* Therefore, if we had recourse to the old-fashioned pressure, our product would be *equal* in *quantity* and *superior* in *quality.*

But we have no need to resort to this system; we may displace until we have produced the exact measure of tincture which we commenced with as spirit; and, be it remembered, the strength of a tincture is reckoned, not by its product, but by the quantity of menstruum at starting. With the ingredients carefully packed, water will drive the spirit through almost to the last ounce, although, as a matter of caution, it may be well to add a few ounces of extra spirit (say four ounces in a couple of gallons) before using the water, thoroughly to ensure this point.

I believe rectified spirit and water are less likely to commingle than proof spirit and water.

The advantages I claim for displacement are—*uniformity, quality, quantity, economy,* and a saving of *time* and *trouble.*

Uniformity, inasmuch as a tincture is made and brought to stock at once; whereas we all know that, however strict the rule of a house may be to *digest, press, filter,* and *measure* off at the stated interval, emergencies will arise in which "a pint or two" must be taken from the bulk for present purposes, before the general straining.

Quality, because the solution of the extractive is more perfect, and commonly the preparation much brighter.

Quantity, as we have no waste by absorption.

Economy, when we want, not to take up the virtue of a given weight of solid in a given measure of menstruum, but to *exhaust* the solid by the *smallest available measure of liquid.*

Saving of *time,* because from twenty to thirty hours will do the work of fourteen days; of *trouble,* inasmuch as presses, flannel bags, and such things, are not needed.

I will not presume to give minute directions for displacement—indeed, it is scarcely possible to do so; I only desire to *uphold it as a method of extraction most valuable to Pharmaceutists.*

Every operator who begins by considering the *great principle* of the process, will rapidly attain a dexterity in it which only practice can give; he will soon see that it is necessary to pass all his ingredients through a sieve of not less than sixty-four perforations in the square inch; and if, in his first attempts, he make his taraxacum or senna into a pudding, apparently impermeable, he will very shortly work his way through the difficulty, and learn that such substances must be treated very differently to others—such, for instance, as cinchona bark. Here, indeed, a little *intelligence, skill,* and *attention* are required; but I can only say that the man who is incapable of attaining them is hardly fit to be entrusted with Pharmaceutical operations at all; it is a libel on the profession to make this a stumbling-block.

As for apparatus, we have an excellent one in glass by Gilbertson, in stone by Ayliff; and almost every man who displaces on a large scale has arranged appliances of his own, simple but effective.

One of our best authorities on this subject is my friend Mr. Deane; indeed, I believe I may thank him for first drawing my attention to it by his paper read before the Society, and published in the first volume of our Transactions.

Since writing the foregoing, I have looked back to that paper, and can but think he has therein described displacement better than I can do; however, reiteration is sometimes useful on a neglected subject.

Mr. Deane directs, that if the first droppings be thick they should be returned, to pass a second time through the ingredients. For my part, I would not return such valuable matter to be diluted by a second displacement, but rather, if necessary, filter the whole product; in practice, I find occasionally the first liquid coming through is thick, or perhaps coagulates from its extreme richness, but that it does not make the whole tincture muddy, when the remaining menstruum is added.

It is almost presumption to differ from such a man, and yet I look with suspicion on the *tap* Mr. Deane recommends in his apparatus, which, although not a *cause*, might become an *encouragement* of evil, by *permitting careless packing;* thus converting the apparatus into an improved *infusion pot*, rather than a *displacement funnel.* I hold that by the time the liquid reaches the bottom (a due period having, of course, been allowed for absorption in the commencement) it has done its work, and may escape. I know Mr. Deane so well, that I feel sure he will forgive my expression of dissent on these points.

Mr. Deane said it was now twenty years since his paper on the displacement process, to which reference had been made, was written, and, with the experience he had since had, his opinions had undergone some modification. He did not think this process presented all the advantages that had been claimed for it, although it was undoubtedly a valuable process in some cases. It was a mistake to assume that by mere percolation all the matter soluble in the liquid employed would be necessarily displaced from the vegetable substances operated upon. Percolation may often take place while much soluble matter remains unremoved. This was especially the case in operating upon vegetable substances containing much cellular tissue. He would take the case of poppies as an illustration. To exhaust the poppies with water by the displacement process, they were first broken up and passed through a sieve. To eighteen pounds of poppies thus prepared, eighteen quarts of water were added, and the whole beaten up well together and put into a displacement apparatus. We have thus a mixture of woody fibre and cellular tissue, from which the soluble matter is to be extracted by the solvent action of the water. The water is absorbed into the cells, and the solution so formed can only be removed by endosmotic action. The mere current in the process of percolation does not displace the contents of the cells, and some time must be allowed for endosmose and exosmose to take place. On this account he considered it necessary to have a tap attached to the apparatus, so as to prevent the too rapid flow of the liquid, or to stop it altogether if necessary. The result of pursuing the operation with the poppies showed that the extraction of the soluble matter in such a case was a gradual process—that the solution and displacement were very imperfect when the displacement was commenced, and, in fact, were never complete as usually conducted. Thus, after macerating the poppies with the water, as already stated, for about twelve hours, he drew off gradually during the next twelve hours twelve successive gallons of liquor, and the specific gravities of these liquors were as follows:—

1.	1038	7.	1012
2.	1038	8.	1009
3.	1035	9.	1008
4.	1030	10.	1006
5.	1022	11.	1005
6.	1016	12.	1004

It was evident, therefore, that after continuing the displacement for twelve hours, the exhaustion of the poppies was anything but complete. A somewhat similar result was obtained in operating upon cinchona bark, although in that case the exhaustion went on more rapidly, in consequence of the more perfect

disintegration of this substance, yet, as the particles of cinchona are very dense, they macerate more slowly, and consequently the rate of exhaustion is not so much quicker as the finer state of division would lead one to expect. In the preparation of some tinctures, the process presented decided advantages, especially when the flow of the liquid was regulated by a tap, and complete exhaustion could thus be sometimes effected with one-half the spirit ordered; but he had found, as a rule, that efficient exhaustion was not to be effected, either by spirit or water, with less of the menstruum than four or six times the weight of the material operated upon, although of course much depended upon the skill of the operator. He considered it a good process for many purposes, and, amongst tinctures, especially for the preparation of tincture of myrrh. He quite coincided in the advantages claimed for displacement by his friend Sandford, except as to "trouble," which he considered rather increased than otherwise.

Mr. Squire considered the subject a very important one, especially at the present time, as it was desirable to ascertain to what extent it should be introduced in the new Pharmacopœia; he therefore suggested that the discussion of it should be adjourned to the next meeting.

The reading of a paper "On the Prevention of Accidental Poisoning," by Mr. Schweitzer, was also deferred until next meeting.

PHARMACEUTICAL MEETING, EDINBURGH.

The Second Scientific Meeting of the Society was held in George Street Hall, Edinburgh, on Monday evening, 17th Dec., at nine o'clock,

MR. J. R. YOUNG, PRESIDENT, IN THE CHAIR.

Mr. Mackay read the following paper:—

SOME REMARKS UPON SHELLAC, WITH AN ESPECIAL REFERENCE TO ITS PRESENT COMMERCIAL POSITION.

We have now and then rapid and unexpected changes in the drug market. At times there are certain premonitory symptoms of such changes, of which those resident in Liverpool and London, and even some at a distance, not unfrequently take advantage. Immediate purchases are made, or contracts for forward delivery entered into, which very often result in large gains to the successful buyer. Or, again, there have been instances of a millionnaire stepping into the market and purchasing all that could be had of a certain article, holding the same, and only selling at an advanced price. Such instances are comparatively rare, because there is in all transactions of this kind, not only an almost unlimited command of capital required, but such a course is necessarily accompanied by considerable risk. A very successful and notable instance of such a case occurred some years ago, when a well-known banking firm bought up all the *mercury* that could be got, either at home or abroad, stored it up, and held until the price advanced so considerably, as to yield a very large and handsome profit, at the expense, of course, of those who were in the habit of using this valuable metal in medicine or in the arts. More recently a house abroad gathered together all the fine Vanilla pods which could be obtained, and in like manner kept this market so bare, that most extravagant prices were paid for the article. So thoroughly was this game played, that at times large tins of Vanilla were consigned to certain parties in London, and if these individuals failed in realizing an increased price, their instructions were quite definite —to return the whole to Paris, there to be stored up, or sold at a limit previously determined upon. At other times a *real scarcity* may be cited as the cause of an advance, and this frequently owing to circumstances over which no one can exercise any control; such as ungenial and unfavourable weather during the season

of vegetation, of which we have at the present time very good examples in the scarcity and consequent high price of belladonna, peppermint, and lavender, or in the cream of tartar market, where the continued high price is owing to the effects of the oïdium or vine disease interfering with the production of wine, and thus reducing the quantity of deposit from which this article is procured. But to go still further from home, and to come more especially to speak of the article it is my intention very shortly to introduce to your notice, I may at once refer to the extraordinary position which shellac holds at the present time in the commercial world. This substance is known to us all, for although not used in medicine, it is extensively employed in the arts. Thus, it is the principal ingredient in our finer kinds of sealing-wax, while in that very important manufacture, hat-making, it is not only largely employed, but no substitute can be found. For wood polish it is a necessary ingredient, and our pianos and other pieces of beautifully polished furniture, would be less pleasing to the eye were we deprived of shellac. In varnishes used by the upholsterer and others, its presence cannot be dispensed with ; while the dye, which forms an integral part of this gum resin, is so much used by the woollen manufacturer, that even the gay clothing of our soldiers would be dull and dim without the aid of the permanent and beautiful lac dye.

Before speaking of its commercial relations, it may not be uninteresting to refer more particularly to the manner and places of production. Our supplies are obtained chiefly from the East Indies, the districts most noted being Assam, Pegu, Bengal, and Malabar, and along the course of the Ganges.

The shipments are, however, made principally from Calcutta. In the districts above named there are two or three very large establishments at which they employ more than a thousand hands. Besides these factories, there are numerous makers on the small scale. A feeling of secrecy pervades the establishments, and strangers are refused admittance. On the twigs of certain trees, known as the *Ficus religiosa*, *Ficus indica*, *Rhamnus jujuba*, *Croton lacciferum*, and the *Butea frondosa*, found in the jungle and forests of India, a small insect called the *Coccus ficus* fixes, and there deposits a certain quantity of a dark coloured resinous matter. This, on careful examination, has been found to be the stomachs of those insects left there after death as food for their larvæ, the outer or specially resin coating being intended for the shelter and protection of the young. It is about the months of November or December that the brood make their escape from their previously protected habitations, and fasten themselves in their turn upon the small branches. As these increase (which they do very rapidly) the twigs or stems become completely covered, and at a particular season of the year are collected, placed in sacks, and carried to the manufactory. These encrusted twigs are first ground in a mill to rough powder, and then carried away to what is called the dye work of the establishment. Here troughs are ready for their reception, and after being immersed in water, the natives commence and tread upon the material, so as to remove the dye from the resin, &c., and as this colouring matter is soluble, it is in a short time taken up by the water, run off into other suitable vessels, fresh water added, and the process continued, with the addition of fresh quantities of water, until the whole is completely exhausted. The remains are then collected, the woody fibre, &c., got quit of, and the little particles which remain freed almost entirely from colour, called and recognized in our market as Seed Lac. The different waters which have thus taken up in solution the colouring matter of the stick lac, is run into cisterns or vats, where the deposition in course of time takes place, and then the powder in the form of paste is partially dried, put into square cases, stamped, and thoroughly dried, forming the regular lac dye of commerce. It is sent home to this country in those square blocks, and reduced to powder for the purpose of trade. I may as well dismiss this part of my subject by stating, that this dye is used very largely and very extensively in dyeing woollen goods. Struck with a perchloride of tin, it becomes a fine and very beautiful scarlet. This preparation is well known, being made by boiling tin in hydrochloric and nitric acids, and from its general use for the above purpose has commercially received the name of *Lac Spirits*.

The great commercial importance of this article may be better understood when I mention, that from Calcutta alone the annual export is supposed to be very nearly our millions of pounds' weight.

The different kinds of shellac may be named as follows:—

Stick Lac.	Seed Lac.
Shell Lac.	Lump Lac.
Button Lac.	White Lac.

Various shades of some of the above receive the names of garnet, liver, and orange. These are dependent upon the quantity of natural lac dye left in the seed lac before it is prepared, as will be immediately noticed. The five kinds first enumerated are imported; the last is prepared in this country.

Stick and seed lac require little notice. The former is the natural production of the insect already described, and the latter is the remains after the extraction of the colouring matter to form the lac dye. The small granular pieces of gum resin left are collected as free from extraneous matter as possible, and dried in the sun. Button and shell lac are the two descriptions most employed in this country, and are both prepared from the seed lac as follows:—The grains are placed in long sausage-shaped bags and heated before fires, until the liquid resin exuding slowly through the interstices of the cloth is scraped off, and immediately transferred to the highly polished surface of earthenware cylinders, heated by being filled with hot water. The melted lac is spread over these cylinders by men, women, or boys, who use for this purpose a palm leaf, and thus produce cakes about twenty inches square. It is then, when cool, thrown into chests, and by the transit becomes much broken ere it arrives in this country. The finest bright orange shellac is believed to be coloured artificially, and I think correctly—having had occasion more than once to reject samples from their peculiar light yellow shade. Orpiment is thought to be the colouring matter employed.

Button, block, garnet, and liver lac, are all produced more or less carefully from different qualities of seed lac, the colour and appearance depending entirely upon the districts from whence the seed lac has been obtained, and the completeness of the removal of the lac dye. Nothing more need be added as to the preparation of these lacs—and, indeed, I believe no further particulars are known. White lac is prepared in this country from ordinary shellac, by being first boiled in a solution of carbonate of potash, through which a stream of chlorine is then to be passed. Hydrochloric acid is added, and last of all red lead. The white pulpy mass is then collected, washed, and pulled into sticks of different lengths. This description of lac is not much employed, being chiefly consumed in manufacturing the different light shades of fancy sealing-wax. Before proceeding to the closing part of these remarks—viz. the present commercial relations of this article—it may be stated that good shellac should contain from 84 to 90 per cent. of resin alone, with varying quantities of colouring matter. When not carefully prepared, a quantity of sand is often present, which deteriorates the lac, and depreciates its value when used for varnishes, &c.

For about two years there has been a steady, but most unaccountable, rise in the price of all descriptions of lac. Thus, in October, 1858, the price in the London market, as well as in Liverpool, was 82*s.* per cwt. During the same month in 1859 it reached 123*s.* per cwt., and in October, 1860, it sold in the same markets at 260*s.* per cwt.; while in both the enormous price of £14 has, within the last fortnight, been obtained. At first sight, one is very apt to consider such extreme prices the result of speculation, but I have ascertained the last quotation from Calcutta, I mean in the market there, to be 57 rupees per maud. There are, I understand, 3 mauds to every 2 cwt., or a maud and a half to each 112 lbs.; so, allowing each rupee to be worth 2*s.* of British currency, we have the cost in India before shipment as £8 11*s.* The estimated expense of freight, &c., may be roughly stated as £2, which brings up the price on landing to £10 11*s.* This appears a very good margin for the importers. But it is said on pretty good authority that there are not at present fifty chests of really good, fine, orange shellac to be got in London. If this be correct, then the difference given above, between the net value as imported and the price realized here is not to be wondered at, nor can it be called excessive. It might, however, very naturally be asked, what is really the cause of such high prices and such scarcity? The most feasible reason, and I believe the true one, is, that the native forests where lac has hitherto been found in such abundance, have suffered so dreadfully from the ravages and devastation of war, that the native

collectors have failed entirely in obtaining supplies of the raw material. Now this is highly probable, for we know that some of the largest lac factories are on the banks of the Ganges ; but then in more peaceful districts this reason cannot be considered tenable. I am somewhat inclined to suppose that there is really a natural scarcity in the jungle of the little lac-producing insect, and that these two causes, operating together, have brought about the present state of matters. One very incomprehensible thing is, that the prices of lac dye have not risen, and that there is a plentiful supply of this article in the market. This, of course, can only be accounted for in two ways—either, that the supply meets the demand, or that very large quantities have been stored up before the scarcity of lac began.

The quantity of all kinds of gum lac exported from Calcutta annually about eight years ago was supposed to be about 1800 tons, while, in 1858, it fell to about 700 tons, in 1859 about a fourth less, while during the present year the quantity has considerably increased. But in November, 1858, the stocks on hand in London and Liverpool were 3959 chests and bags ; same month in 1859, 1316, and in November, 1860 (last month), 1345. Of these I cannot tell the relative proportions of orange, garnet, or livery. Of course, all descriptions are included. There are vessels, however, now afloat and expected to reach England in due course, having on board no less than 3192 chests and 363 bags of shellac, which, doubtless, if they do not sink to the bottom of the sea, ought to raise our home stocks, and tend to reduce prices ; but we are told, on the other hand, that there is a large demand for the American and foreign market, while all our drug and other merchants at home are so bare of stock, that they will be ready to buy whenever the price moderates.

I dare say it must have occurred to more than one to inquire why, with such extravagant prices, some other substance or compound has never been thought of and introduced instead of shellac. This has been done, but most unsuccessfully. When in London, about eight months ago, I was shown an article which a company just established were about to make and sell instead of shellac. The price was £3 per cwt. cheaper, and those about to engage in its manufacture were sanguine as to the ultimate results. I was told, whenever it was ready to send out in quantity, a sample would be sent. Accordingly, about a month afterwards, a parcel arrived, regarding which my opinion was requested. After carefully trying the article, I gave a report condemnatory of its use in any of the arts or manufactures in which the regular lac had hitherto been used. Although I was little thanked for this opinion at the time, I do not think the stuff I now show continued long to be made. Indeed, it really appears to be little else than a mixture of shellac and some aloetic resin, very probably Cape aloes. Be that as it may, I am satisfied from experiment that it could never come into competition with even inferior kinds of shellac.

In closing these few remarks, I may be allowed to express a hope, that lac has seen its highest price, and that during 1861 it will be considerably reduced. I am very unwilling to believe, that native supplies have really become extinct ; while the enormous comparative prices still existing, cannot but tend to increase that activity and energy in searching for fresh supplies, which will, I trust, result in sending more raw material to the native lac manufactories, and thus by increasing stocks at home, gradually reduce the market price to something more moderate, and approximating the steady prices at which shellac has until lately stood on the price list.

After some remarks by Dr. S. Macadam and other members, a vote of thanks was proposed and carried to Mr. Mackay for his communication.

Mr. Young, in the absence of Mr. Joseph Turner, then read the following remarks:—

ON THE DESTRUCTIVE DISTILLATION OF COAL IN GAS MANUFACTURE;

But more particularly the Treatment of the Liquid Products with the Processes used by Major and Turner, at their Works, Chester and Wolverhampton.

BY MR. JOSEPH TURNER.

Coal is formed by the long-continued decomposition of vegetable matter under pressure, by which carbonic acid, water, and carburetted hydrogen are separated.

The change is not a case of cremacausis. The presence of oxygen is not essential, the elements grouping themselves into new compounds, in a manner somewhat analogous to that which occurs in fermentation.

When coal is examined by the microscope, the remains of vegetable cells and vessels are easily detected. It contains the following organic elements :—Carbon, hydrogen, oxygen, and nitrogen, much less water, and a larger per-centage of carbon and nitrogen than wood, and it requires a much higher temperature to decompose it.

Its inorganic elements are silica, alumina, oxide of iron, bisulphuret of iron, or iron pyrites, with carbonate and sulphate of lime.

In the manufacture of gas for illuminating purposes, coal is exposed in retorts to a high temperature, when it is decomposed. The volatile matters given off are conveyed to a condenser, in which the liquid products are separated from the gaseous, which consist of light carburetted hydrogen, olefiant gas, and the vapours of several carbo-hydrogens, together with ammonia, sulphuretted hydrogen, and carbonic acid, which, when purified by the separation of the three last-named substances, constitute what is supplied to us as coal gas by the several companies.

The liquid products separate by their own specific gravity into two liquids, the lighter being water containing ammonia combined with sulphuretted hydrogen, carbonic and hydrocyanic acids. A few years ago a patent was taken out for the preparation from this liquor of Prussian blue (cyanuret of iron), by a process which recovered the cyanogen it contained. The heavier portion, generally known as coal tar, is the volatile oily matter of the coal, holding carbon in suspension, which produces its characteristic black and thick appearance.

It is to these products, more particularly, that I purpose to direct your attention, and intend giving a short outline of the processes for utilizing and for separating from them the numerous valuable compounds which they yield.

Next to gas, tar is the most important product from coal, now yielding large revenues to the gas companies, although formerly it was a source of great annoyance, trouble, and expense to get rid of. It amounts to about $4\frac{1}{2}$ per cent. of the weight of coal carbonized. In our process the tar is distilled in large wrought-iron stills, which contain a charge of 3 to 5000 gallons. Heat being applied by means of fires underneath the stills, light oil, together with water and ammonia, first passes over. This is collected separately, as long as its specific gravity is lighter than water, and then undergoes further processes, which will be described hereafter. Then comes the creosote, heavy or dead oil, as it is known in commerce. This is collected until it begins to thicken on cooling, when the distillation is finished, pitch remaining in the still, which is run out into a covered brick tank to cool, where it is broken up and cleared away. The treatment of this article will be noticed further on.

One hundred parts of tar yield about 50.0 pitch, 40.0 oil, 4.7 naphtha, and 5.3 of water, ammonia, and gaseous matter; the latter is dissipated or burned under the still. But these proportions vary much according to the temperature used in decomposing the coal, and the quality of coal, cannel yielding the largest amount of naphtha.

This oil or creosote of commerce, now so extensively used for preserving timber, is a mixture of several neutral, basic, and acid volatile oils, some solid, but most of them liquid, at the ordinary temperature ; it is heavier than water, of sp. gr. about 1.020, becomes almost black by exposure. Its antiseptic property is in a great measure due to the carbolic acid it contains, which amounts to from six to ten per cent. When injected into timber it prevents the absorption of moisture in any form or under any change of temperature, and is noxious to animal and vegetable life, thereby repelling the attacks of insects and preventing the propagation of fungi, by coagulating the albumen contained in the sap ; it also arrests the vegetation or living principle of the tree after its separation from the root, which is one of the primary causes of dry-rot and other species of decay. A short description of the process may prove interesting.

It is most perfectly applied in strong closed cylinders under pressure, similar to a steam boiler, varying in size from six feet diameter and from twenty to eighty feet long. The cover or door being the full size of the cylinder with appliances to screw quite air-tight, the pressure on so large an area is very great.

The timber is loaded on small trucks, which are run on rails inside the cylinder; when charged, the cover is fastened and made tight, and a vacuum produced by an air pump, and the creosote injected into the pores of the wood by a pressure of one hundred and fifty pounds to the square inch, when as much as eighteen pounds of creosote has been forced into a cubic foot. When ten pounds of creosote has been injected into each cubic foot of timber, the process is considered complete and perfect. Railway sleepers so prepared have been in use for nearly twenty years, and when examined found comparatively sound.

Creosote is a most effectual protection against most of the attacking insects. The teredo is the most destructive of the marine, and the white ant the most devouring of the land insects. This process ought to be resorted to on all occasions where the smell of creosote is not likely to be objectionable.

The light oil before mentioned, its sp. gr. .970, is placed in a retort or still and steam blown through it, which carries over the spirituous substances with its vapour. These are treated with sulphuric acid and washed with water, then with soda ley, this removes the basic and acid oils, and then re-distilled either by steam or fire, and the distillate collected until its specific gravity rises to 0.880, water being 1.000. It is a perfectly colourless liquid, with a mean sp. gr. of .876, used for burning in lamps, but principally by waterproof clothing manufacturers for dissolving india-rubber. This is rectified mineral naphtha of commerce, a mixture of several neutral oils or hydrocarbons. According to Mansfield, light oil contains the following spirituous or oily substances:—

Alliole,	boiling at	140° to 150° Fahr.
Benzole,	"	176° Fahr.
Toluole,	"	230° "
Cumole,	"	284° "
Cymole,	"	338° "

Benzole, C_{12} H_6, is the most important, and may be separated by conducting the vapours of naphtha from the still heated by fire, through a head or worm kept at a temperature of 212° F.; this separates oils that are not volatile at that temperature; the uncondensed vapours are then carried to a condenser. The product is now distilled in a water-bath, at a temperature of 212° F.; the distillate is benzole of sp. gr. .870, well known as benzine collas. It is an excellent solvent of camphor, essential oils, fats, wax, sulphur, phosphorus, iodine, india-rubber, gutta percha, gum lac, gamboge, and copal and anime resins.

Atmospheric air, saturated with its vapour, gives a bright luminous flame, and may be burned as gas.

Benzole can be further purified by freezing, becoming solid when exposed to a low temperature. The degree of cold requisite to solidify the fluid depends upon its purity. If nearly pure, it will become solid at 32° F. It boils at 176°, and its specific gravity is 0.850.

Nitrobenzole, NO_4 C_{12} H_5, or artificial oil of bitter almonds, is obtained by adding benzole very slowly to fuming nitric acid (sp. gr. 1.500). It requires rather more acid than benzole; when the acid will dissolve no more, it is heated, so that it may take up all the benzole. It is then thrown into four or five times its volume of water ; the nitrobenzole separates, and falls to the bottom as a heavy oily liquid. It is now washed with a solution of carbonate of soda, and then water. It is a yellowish-looking liquid, of specific gravity 1.209 ; boils at 415° F., and has a powerful odour of essential oil of bitter almonds, and a sharp, sweet taste. Used extensively in perfumery, for scenting soaps, &c. It may be rectified, but is very easily decomposed by the high temperature necessary in distilling it.

Should the benzole used contain less volatile oils, the product will have more of the flavour of cinnamon. Nitrobenzole may be viewed as benzole, C_{12} H_6, in which one equivalent of hydrogen is replaced by nitrous acid.

The basic oils in coal tar are aniline, picoline, and pyrrol.

Aniline, C_{12} H_7, N. Synonymes, *Crystalline*, *phenylamine*, *phenamine*, *phenamide*, *kyanole*, and *benzidam*. Discovered by Unvondorben, in 1826, in the destructive distillation of indigo, and by Runge, in 1837, in coal tar; it is recognized by its property of striking a deep violet blue with solution of chloride of lime. From this property it obtained the name of kyanole.

It may be obtained from the acid which has been agitated and drawn off from the light oil in rectifying naphtha, by adding an alkali, such as lime, to neutralize it, when impure aniline separates on the surface, and is purified by converting it into oxalate and distilling this salt (after several crystallizations) with potash.

But is now prepared at once pure by the action of reducing agents, such as sulphuretted hydrogen on nitrobenzole, when the latter loses the whole of its oxygen and takes up two equivalents of hydrogen; or by distilling one part of nitrobenzole, one of acetic acid, and two of iron filings to dryness. Aniline is obtained in the receiver, mixed with water and acetic acid.

It is a colourless liquid, with a strong aromatic odour and a sharp burning taste. Boils at about 390° F., specific gravity 1.028, slightly soluble in water, very soluble in alcohol and ether. It coagulates albumen and precipitates metallic salts.

Nitric acid converts it into picric acid; chromic acid gives, according to the degree of concentration, a green, blue, or black precipitate; a drop of it on fir wood, moistened with hydrochloric acid, strikes a deep yellow colour. It neutralizes acids, forming salts which have a great tendency to crystallize. Hence the name crystalline. It has become a most important and valuable substance, and has received extensive application in the production of dyes. Inventions have been patented for producing various shades of colour from pale lilac to deep violet. They are substantive colours, and therefore require no mordant.

Picoline, $C_{12}\,H_7\,N$., is another volatile oily base, isomeric with aniline. It is found in the most volatile portion of the basic oils, boiling at 272° F. It has no action on chloride of lime or on fir wood.

The volatile oily acids of coal tar are carbolic, rosolic, and brunolic acids.

Carbolic Acid, Hydrated Oxide of Phenyle, $C_{12}\,H_5\,O, HO$, is separated from the oil of coal tar, by agitating it with twice its volume of potash or soda ley. The aqueous solution, on the addition of an acid, yields impure hydrated carbolic acid as a heavy oil. It is purified by rectification with a little solid potash. It is an oily liquid, colourless, and of a high refracting power, neutral to test paper. Specific gravity, 1.065. Has a burning taste, and the odour and properties of creosote. Under certain circumstances it forms long needle-shaped crystals. Pine wood dipped first in carbolic acid and then in nitric acid, becomes of a deep blue, which passes into brown.

The solid hydrocarbons are naphthaline, paraffine, chrysene, and pyrene.

Naphthaline, $C_{10}\,H_4$, is very abundant when the coal has been decomposed at a high temperature. It is easily obtained from the latter portions of light oil. If collected separately and set aside, it will become semi-solid. This is well squeezed, and purified by crystallization from naphtha or sublimed.

Pure naphthaline is colourless and volatile, dissipates like camphor when exposed at the ordinary temperature. Forms large tabular transparent crystals of a very peculiar smell, and an acrid aromatic taste.

It boils at 414° F., but distils easily with the vapour of water and oils of lower boiling point. It is a very interesting body in chemistry, combining with chlorine and bromine, and also gives rise to a large number of compounds formed by substitution. Sulphuric and nitric acids produce a number of new compounds with it. It has not been applied to any use in the arts. It contains so much carbon, that it cannot be burned without emitting much smoke.

Paraffine, $C_{20}\,H_{20}$, exists in very small quantity in coal tar, being destroyed by the high temperature necessary in decomposing the coal for gas manufacture. It is not in sufficient quantity to repay the labour and expense of extracting. It is a white volatile substance, in appearance similar to wax or spermaceti. Melts at 110° F., and distils unchanged at a high temperature, and may be obtained from its solution in ether in shining scales. Sp. gr. .850.

It burns with a beautiful clear white light, free from smoke, and superior to wax; acids and alkalies do not act upon it.

It is obtained in largest quantity from Rangoon petroleum.

Chrysene and Pyrene are also crystallizable solids found in the last portion of the oil that distils from coal tar.

Chrysene is yellow and fusible at 455° F.; its composition is $C_{12}\,H_4$.

Pyrene is white and more fusible; its composition is $C_{15}\,H_3$.

We now come to the residuum of the distillation, viz. pitch, the application and uses of which are very numerous.

By exposing it to a still higher temperature in ovens with a suitable arrangement for condensing, it yields about twenty-five per cent. more volatile matter, which, on cooling, becomes semi-solid, and principally consists of modified forms of naphthaline or paranaphthaline, pyrene, and chrysene. The residue in the oven is nearly pure carbon, very heavy and compact, well suited for the smelting of iron, as it is free from sulphur; on this account it fetches a high price.

The pitch is now also used to convert small waste coal, almost valueless, into excellent merchantable coke, when it is not of a bituminous nature, and consequently will not coke of itself.

Process.—The pitch is ground and mixed with seven or eight parts of coal, and put in an ordinary cokeing oven; the vapours from the pitch are decomposed, depositing their carbon on the coke in the process of burning, which adds greatly to its density, and considerably increases the product from a given quantity of coal.

But by far the greatest outlet for pitch is in the manufacture of patent fuel, the consumption of which is great. This manufacture is carried on most extensively in South Wales, in the neighbourhood of the anthracite coal beds.

The pitch is ground and mixed with seven parts of small coal, heated together, and moulded into bricks by great pressure, when it forms a compact mass of similar specific gravity to coal. It is used by steamers plying on distant stations, and is found to possess many advantages over coal.

Pitch is also used for asphalting pavements and roofs, and to a limited extent in ship-building, and by varnish and lamp black manufacturers. Had time admitted, I would have explained this manufacture as it is connected with our subject.

Ammoniacal liquor of gas works.—Ammonia is formed when organic substances containing nitrogen are exposed to a high temperature. Therefore, in coal the nitrogen passes over as ammonia combined with sulphur, carbonic and hydrocyanic acids and water.

Coal yields about six per cent. of this liquor; its strength depends upon the care taken in separating the ammonia from the gas; its value is estimated from the quantity of sulphuric acid required to neutralize it; the weakest we buy is six ounce liquor, that is the quantity of acid necessary to neutralize one gallon, but we often get ten and twelve ounce liquor.

This we pump in our process into large boilers, holding about six thousand gallons, when heat is applied in the ordinary way by fires. Attached to the boiler is a pipe of sufficient size to carry off the vapour as it is formed to a large cistern lined with lead, and charged with sulphuric acid, sp. gr. about 1.500. The pipe dips a few inches below this acid, the cistern is covered over, with an outlet pipe fixed from the top to carry off the gases (sulphuretted hydrogen is given off in large quantity), this dips into a cast-iron box containing sufficient water to seal the end, from this the gases are carried, and pass through the fire which heats the boiler. By this process they are decomposed. The intermediate vessel is to prevent injury to the acid cistern in case of explosion, as it could not pass beyond where the pipe is sealed; this arrangement prevents any nuisance attending this manufacture. Heat is applied to the boiler as long as any ammoniacal vapours pass over. Some manufacturers add lime, but we find that the wear and tear of the boilers are so much greater by its use that any extra ammonia so obtained does not compensate for this loss.

When the acid in the cistern is neutralized, it is then drawn off and boiled down in lead cisterns, by arranging in them a coil of pipe, through which high pressure steam passes; when the liquor deposits crystals it is transferred into shallower cisterns, when it becomes nearly solid on cooling. The sulphate is next put into strainers to drain. It is perfectly white, and fit for making any of the salts of ammonia. The largest consumption of this salt is in the manufacture of artificial manures.

In conclusion, I may mention that this paper was written with a view of giving a practical description of the processes used in working up the residuum or secondary products of gas works, now one of the most important branches of our manufactures, and one in which there is a very wide field for chemical investigation.

To give an idea of the value of such products, I may mention that a short time

since an engineer (who is now deceased) of one of the largest London gas works told me that their receipts for the sale of tar and ammonia liquor were about £8000 per annum. At the extensive works of Messrs. H. P. Burt and Co., Rotherhithe, the consumption of creosote for the preparation of timber for some time last winter was about 16,000 galls. per diem. This will give some idea of the extent to which it is used in the country at large. Twenty years' experience of railway and hydraulic works proves that this is the only preventive of decay that can be relied upon. The processes of Margery, Sir W. Burnett, Payne, and others, have now become nearly disused.

Since writing the above, I have seen an article in the *Chemical News* upon the distillation and rectification of coal tar from gas works, the products from which differ very much from any we have ever obtained in our experience. For instance, the mean specific gravity of the spirit obtained is given as .850, and of the heavy oil .880 to .885; whilst our rectified naphtha is of sp. gr. .876, and the heavy oil 1.020. I must infer that spirits of such specific gravity can only be obtained from schists or boghead cannel by distilling solely for their liquid products, and that they cannot be obtained from the tar of gas works in any quantity.

Various specimens illustrative of these remarks were submitted to the meeting, and the Secretary was requested to transmit a vote of thanks to Mr. Turner for his communication.

Mr. MACKAY then described Mr. Bailey's lamp. These lamps were made in Wolverhampton, and are patented by the proprietor, being intended for the purpose of burning paraffine oil, or other liquid of the hydrocarbon kind. The light was much admired, and the remarkable price at which the whole, including a glass chimney, was produced, surprised every one.

The Convener of the Prize Essay Committee read the following report :—

THE REGISTER-FUND PRIZE.

The Committee appointed by the Council of the Pharmaceutical Society, having carefully perused the "Essay on Poisons" submitted to them, have decided that it does not possess sufficient originality of thought on the subject to warrant them giving the author the prize offered.

At the same time, they think it deserves credit for the care with which it is written, and the amount of reading evinced in its production.

The author will get the essay returned, and at the same time the envelope containing his name, on an address being forwarded to the Secretary, Mr. John Mackay, 121, George Street, Edinburgh.

Edinburgh, 17*th December*, 1860. WM. AINSLIE, *Convener*.

The SECRETARY then stated the regret of the Council that there had been so little competition among the Associates and Apprentices in the matter of Essay writing, believing, as he did, that if the younger members of the Society were as willing as they were able, many would ere this have entered the lists. He intimated that two Prizes would be given for the best Essays, and that such papers would require to be sent to him as usual by the 1st March, 1861. These Essays may be on any subject connected with Chemistry or Pharmacy, and are open to all Associates and Pupils of the Society throughout Great Britain.

The meeting thereafter adjourned.

Edinburgh, 18*th Dec.*, 1869.

PROVINCIAL TRANSACTIONS.

BIRMINGHAM CHEMISTS' ASSOCIATION.

President, Mr. Holdsworth.—*Treasurer*, Mr. Leay.—*Committee*, Messrs. Thonger, Snape, Atkins, Collis, Whittles, Foster, Morris, Scott, Charles Bird, Canning, Peacock, Loe, Holdsworth, Wood, Adcock, Leay, Wright ; and Mr. Alfred Bird, *Honorary Secretary*.

A meeting of Chemists and Druggists (adjourned from October 31st) was held at the Midland Institute, on the 23rd of November, 1860, to consider the desirability of reviving the Birmingham Pharmaceutical Institution, and to receive an offer from the "Council of the Institute" to this effect, that, with the understanding that the Chemists and Druggists of Birmingham and neighbourhood will allow their apprentices and assistants to attend Mr. Williams's Chemical Class, they, the "Council," will, free of cost, provide a room for the Pharmaceutical Library, and for the occasional committee meetings; also allow the use of the theatre for the annual meeting.

Mr. Thonger having taken the chair, the following resolutions were unanimously passed:—

1. Moved by Mr. Bird, seconded by Mr. Wright—"That the offer of the 'Council of the Midland Institute' be accepted, and that the best thanks of the meeting be tendered to the 'Council' for the same."
2. Moved by Mr. Loe, seconded by Mr. Snape—"That the name of the Birmingham Pharmaceutical Institution be changed to 'The Birmingham Chemists' Association.'"
3. Moved by Mr. Holdsworth, seconded by Mr. Whittles—"That the subscription to the library shall be, for Principals 5*s.* per annum, and for Assistants and Apprentices 2*s.* 6*d.* per annum. The books and periodicals to be circulated before being deposited in the library."
4. Moved by Mr. Thonger, seconded by Mr. Scott—"That Mr. Holdsworth be 'President' for the first year, commencing January 1st, 1861."
5. Moved by Mr. Canning, seconded by Mr. Wood—"That Mr. Leay be the 'Treasurer.'"
6. Moved by Mr. Scott, seconded by Mr. Morris—"That Mr. Bird be 'Honorary Secretary.'"
7. Moved by Mr. Thonger, seconded by Mr. Bird—"That Messrs. Snape, Thonger, Atkins, Collis, Whittles, Foster, Scott, Charles Bird, Leay, Morris, Peacock, Canning, Loe, Holdsworth, Wood, Adcock, and Wright, be the 'Committee' for the ensuing year."
8. Moved by Mr. Atkins, seconded by Mr. Peacock—"That, with the best thanks to Mr. Collis, his offer to collect subscriptions for the ensuing year be accepted."
9. Moved by Mr. Canning, seconded by Mr. Scott—"That Mr. Holdsworth's and Mr. Bird's offer to provide a Librarian for the first and second six months, for half an hour, at half-past eight, on Monday evenings, to give out and receive in books, be accepted."
10. Moved by Mr. Whittles, seconded by Mr. Morris—"That the next meeting of the Committee be held the second Friday in January, 1861."

Mr. Thonger having left the chair, a unanimous vote of thanks was presented to him for his courteous conduct therein.

N.B.—The fee for Mr. Williams's Chemical Class, which meets every Friday evening, at eight o'clock, is 3*s.* per term of twelve lessons, to be paid to Mr. Oliver, Secretary of the Midland Institute.

ORIGINAL AND EXTRACTED ARTICLES.

PROSPER ALPINUS.

De Medicinâ Ægyptiorum Libri quatuor. A.D. 1591.

BY MR. JOSEPH INCE.

About three centuries ago, Prosper Alpinus, Scholar and Physician, was minded to learn something about the wisdom of the Egyptians, and to communicate the result of his inquiries to posterity. On one of my morning expeditions, I discovered this ancient volume on a book-stall, and I thought it would not be undesirable, in presenting my copy to the library of the Society, to give at the same time some general notion of the contents of the book.

The work was published at Venice, date 1591 (Pereira quotes an edition of 1745), and was dedicated to the Senator Antonius Maurocenus. The present specimen is printed in that bold type and on that excellent paper, which were both characteristic of that painstaking age.

The introduction is given in the form of an imaginary conversation between the Author and Melchior Guilandinus. The latter congratulates Alpinus on his safe return to Padua, "knowing that men who travel, run many and strange perils, and that especial danger was to be encountered in Egypt both from the nature of its climate and the extreme heat of the sun." Alpinus expresses his great joy at having providentially escaped, confesses that from a child he had had a strong desire to travel, "for that no one could be a perfect physician who had not visited different countries and places, and had not observed the diverse customs of the world." Alpinus proceeds forthwith to relate how he set out for Egypt in company with the most illustrious George Hemus, who had been chosen by the Republic of Venice as Consul for that Province—Franciscus Alpinus, Physician, "and my dearest father," strongly urging the expedition on his son.

Guilandinus is loud in the expression of his approval, and entreats Alpinus to detail his late adventures. Nothing loth, the Author begins to tell how, Anno à Virginis beatissimæ partu 1580, on the 21st of September, the expedition sailed for Egypt. When a man undertakes a voyage, and afterwards writes a book, one may be pretty sure that he meets with a storm in which he is nearly shipwrecked. Alpinus forms no exception to the general rule: adverse winds lash the sea into a tempest, and, in presence of impending death, he has a fair opportunity of quoting Ovid and Lucretius.

"Certa quidem finis vitæ mortalibus adstat,
Nec devitari lethum pote quin obeamus."

Nevertheless, on the morning of the 22nd October, they got safe and sound to Corcyra. It is interesting to read, but not very profitable to recapitulate the various adventures which befel the crew, until, to their great joy, they saw Alexandria in the distance, and thought that they had attained to the end of their dangers and of their journey; but at this critical moment their hopes were suddenly frustrated by a dead calm, which would have proved disastrous, had not the Prefect of Alexandria sent out a trireme to their aid, which towed them successfully into harbour.

It was then March, but they stopped at Alexandria till July on account of the plague which raged at Cairo, which place they reached by the Nile route early in that month. Here the travellers rested, and took up their residence for more than three years, until at length, in the year 1584, they quitted Egypt by a vessel called Balbiana, returning by a two months' passage to their own homes. At this point of the narrative, Guilandinus branches out into a general eulogium on the benefits of travel, at the conclusion of which he desires Alpinus to recount some of the practical results of his foreign tour. Alpinus replies that he confined himself strictly to the study of medicine, and had made himself thoroughly conversant with the habits, practice, and medical learning of the Egyptians. The two friends therefore agree to discuss these subjects, the result of their conversations being embodied in the work in question, which is divided into four books, and entitled De Medicinâ Ægyptiorum.

These ancient records derive their chief interest from the fascination always attending the memorials of the past; yet it must be confessed that they are more curious than instructive. The third chapter of the first book gives us a strange insight into private Egyptian life, in the article called "Quamobrem hoc tempore Ægyptii artem medicam habeant vitiosam." The low scientific qualifications of the Egyptian Physicians seems to have been in part owing to their extreme adulation of the rich; to such an extent was this servile flattery carried, that they feared to give aperient medicine save in the mildest doses,

lest its undue action might give offence to a titled patient; even cassia, tamarinds, and manna were dealt out with such sparing hand that no effect was realized until the remedy had been exhibited on several successive occasions. "Pluribus etenim vicibus eam purgationem præstant, quod nos vice unicâ facere consuescimus. Sunt tamen alii qui rusticis medentur, cum iis vero prævalidioribus purgationibus agunt, sed, ut dixi, non nisi in rusticis."

The motto of Egyptian medicine was "Contraria contrariis curari." Nothing now appears of special interest until we reach the argument in the twelfth chapter as to whether the use of the water of the Nile for the preservation of health be of more advantage than that of water; neither is allowed to depart with an undisputed palm, and the merits and demerits of both wine and water appear to be most fairly stated. Further on we get fearful details of the plague, and the havoc that it wrought in Cairo.

The Second Book gives us full particulars of the practice of bleeding among the Egyptians; the author blames them, sometimes in no measured terms, for resorting too frequently to such a dangerous remedy.

The Third Book is almost entirely occupied with a description of scarification, and we are presented with a faithful engraving of the operation on the thighs. The physician, in a turban and full-dress costume, is solemnly giving his directions, whilst the patient stands in a shallow pan ready for all emergencies. The doctor's assistant is engaged in puncturing the legs with an appropriate knife, and the wife, noways disturbed, holds a napkin ready for immediate use. Meanwhile, Guilandinus and Alpinus are holding learned argument as to whether the process *hurts*, it being the decided opinion of Alpinus that when the parts have been well treated with hot water, then slapped, and then struck with a reed, that the subsequent sense of pain must be materially diminished (page 92). We are not, therefore, astonished to find ourselves next reading "De variis partium inustionibus, quæ selectissima secreta ad varios curandos morbos apud Ægyptios habentur." A horrible engraving (page 101) gives some idea of these curative burnings. It represents an unfortunate man stretched on a bed; two turbaned torturers are burning him, secundum artem; a third is calmly watching the proceedings, while the patient's only solace is to gaze at the tree seen through the open window. Botany under such circumstances would probably lose some of its accustomed charms.

Leaving these horrors, we are next instructed in the uses of the bath, twenty pages being devoted to the subject, and it is curious to find such a close similarity between Alpinus and the sparkling narrative of Lady Mary Montagu. The Egyptian women used the bath chiefly with a view to acquiring fat, lateral development being esteemed an attraction in the East. We are told that the fair bathers have adopted an elaborate system of anointing, bathing, and eating, in order to secure this object. But apart from the use of the bath as a luxury, it formed an important element in medical treatment, especially in fevers. Here are enumerated at some length the various frictions, scrubbings, and sanitary dislocations, which have been since so amusingly described by modern travellers.

The Fourth Book is more strictly devoted to Pharmacy, the author having wisely left his most interesting particulars to the last, at the same time introducing us to the dark side of Egyptian character. Some passages bring forcibly to remembrance the confessions (of sinister celebrity) since published by De Quincey. I propose giving a few extracts from the second chapter, entitled "De Medicamentis ab Ægyptiis animi gratiâ usitatis, quibus sperant his devoratis, varia exoptata in somniis se visuros."

It appears that the whole race of the Egyptians, nobles and common people, were alike addicted to this vice, steeping themselves in luxurious and oblivious ecstasy by means of such stimulants as they were able to afford. These

stimulants were five in number—Assion, Assis, Bosa, Bernavi, and Bers. Assion is the Greek μηκόνιον, the English opium. The passion for opium swept over the nation like the deluge. Joannes Jacobus Mannus (predecessor of Alpinus at Venice) relates that there was a man sailing along the Nile to Alexandria who ran short of his daily opium—the poor wretch instantly quitted the vessel, and started full speed for Cairo, with such rapidity that none of the passengers could overtake him, so great was his dread of being left one hour without his habitual solace. Another sailor, who had to convey several passengers in his vessel to Alexandria, exhausted his stock of opium in the middle of the journey. He was instantly attacked with dangerous symptoms, fell into syncope, from which he was only rescued by the freewill offering of more opium from the crew. Let us be thankful that our railway drivers limit their devotions to the fragrant weed.

Assis is the powder prepared from the leaves of the Cannabis. Assis is an equivalent expression to Herba, Cannabis being esteemed *the* herb, to which all others were inferior. The powdered Cannabis was mixed with water, worked up into a paste, and formed into boluses. Its effects became apparent in about an hour, when it produced a sort of delirious intoxication, the victim (we can use no other word) remaining for some time in an ecstasy of blissful dreams. The poorer classes were the purchasers of Cannabis on account of its moderate price.

Bosa is more valuable, being a compound of darnel flour and Cannabis seeds, mixed up with water.

The Electuary of Bernavus was prepared in the nearest confines of India, and was largely imported into Egypt, the Egyptians themselves being ignorant of its composition. Its effects are said to be marvellous. The dose is one ounce, which first produces great hilarity and buoyancy of spirit. The patient begins to talk at random, to sing amatory songs, to laugh greatly, and to be profoundly happy for one hour. Then comes a change; retribution treads on the heels of enjoyment. Love turns to rage and violent paroxysms of anger. Then in swift turn come sorrow, dejection, and loud lamentation. Gradually the cloud clears, and the patient returns to his senses—perhaps also to his Electuary.

Bers was another Electuary, composed of White Pepper, Sem Hyoscyami Albi, Opium, Euphorbium, Pellitory, and Saffron, a species of delirious Ward's Paste.

The Egyptian Decoctions and Syrups are of little interest, but one of the latter is worth mention;—the Syrup of Sandal Wood, of which the formula is given. Their purgatives are well known: Cassia and Manna for the rich, Scammony and Colocynth for the poor.

The description of Egyptian Pharmacy would be essentially incomplete without some notice of the Theriaca Andromachi Senioris, on the composition of which the Egyptians bestowed the utmost care. Nor was its preparation lightly undertaken. It was forbidden by royal order to manufacture it in private, and it was made once a year, in the month of May, with great solemnity, in a temple called Morestan, the most beautiful of the city of Cairo. All the physicians having repaired thither with their chief, called Achim Bassi, a solemn council was held on its mode of preparation. Then the head Pharmacien, the most skilled in his art, prepared the nostrum in the sight of all the people, and he alone. "He who had this duty at the time I was practising Medicine at Cairo was Mahomet ebne Haly, a man not to be despised for integrity of character, *although a follower of Mahomet*, and who was related to make much of strangers. Never, however, was I on such terms of intimacy with him as to learn from his lips the secret composition of the Theriaca." No wonder, since Italians, Germans, Poles, Flemings, Englishmen, and French-

men, together with a crowd of other travellers, came to Egypt as purchasers, added to which it was not lawful that Christians should know the secret. Guilandinus.—"Did you bribe the Pharmaceutist? Did you overcome his fear and the legal interdict with gold?" Alpinus.—"That never entered into my head, but by chance I had the full and true account of the Theriaca which the Egyptians make, from another Mahomet, with whom I was familiarly acquainted—a man who was by far the most learned in herbs of all the Egyptians, to whom various new remedies were sent by friends from Arabia, Ethiopia, and India. For a few days before I was about to depart from Egypt, by the will of God, it happened to me that I should not leave with a pained mind about the so much desired knowledge of the composition of their Theriaca; and this was brought about not by any bribe, but through his great personal kindness to myself. For as I was going, I saw a very large and wonderful book which had been written by a most learned Egyptian (by the command of some former governor of Egypt), who had most diligently observed all the plants of Egypt, Arabia, and Ethiopia, and had written an account of the plants of those districts. Now, were this book translated into good Latin, it would set at rest all disputes about many foreign remedies. To return to the subject. It was altogether by chance that a few days before my departure, being in want of some simple medicines, I met the said Mahomet, professor of herbs, choosing and preparing in his own Pharmacy the simples for the Theriaca of the Egyptians (at that time interdicted to all medical men), in order to send them to Morestan to Mahomet, the Compounder of the Theriaca. For that Mahomet, who now for so many years had made the Theriaca, was accustomed to receive all the ingredients from him. On my asking him what he was doing, he replied that he was choosing the herbs, juices, gums, roots, seeds, and other simple ingredients for the composition of the Theriaca, which he was about to send to Morestan. Having asked him if he would allow me to read in his presence the record in which the composition of the Theriaca of the Chief Physician of Egypt was written down (authenticated with his own seal), he allowed me afterwards to read it through at my ease, and to investigate it, all that day. When I had read the beginning of the writing with a Hebrew Physician versed in the Italian and Arabian tongues, I recognized for the first time that it was the composition of the Theriaca, which the Egyptian Physicians had determined to make that year for the king of the Turks, to which, as I have said, was affixed the signature of Achim Bassi (the chief). As soon as I got home, I translated it directly from Arabic into Latin, with the aforesaid Hebrew Physician; there being also present Octavius Roveretus, an excellent physician of Trent, who had come to Egypt to practise medicine with Francis Delphinus, the most illustrious Consul in that country for the Venetian Dominions." This is a fair specimen of the circuitous and discursive style of the original, and yet I have purposely left out some of the redundant phrases of the author, lest the quotation should prove too wearisome.

Next follows the formula for the Theriaca, containing fifty-nine ingredients, about which, perhaps, the less we say the better. The discovery evidently made Alpinus most sincerely happy, and the thought never marred his rejoicing, that the wisdom of one age may be the folly of the next.

Those who are interested in these curiosities of the literature of medicine need not be reminded of that golden book the *Pharmacologia* by the late Dr. Paris, than whom there was no man better acquainted with the accurate investigation and advancing science of the present age, nor yet one who loved more to revive the memories of the past. But the hour warns me to conclude, and I may adopt for my own the last sentence of Alpinus—"Perpulchra sane videntur, minimèque inutilia quæ dixit, modo, pro quibus non parvas gratias tibi habeo. Sed tempus nunc nobis suadet ut paululum quietis nunc capiamus, reliqua in

altera die dicenda remittentes, quando parum diei nunc supererit, nam video solem penè ad occasum jam accessisse, ex quo etiam in hâc die illa absolvi à nobis non potuissent."

31, *Southampton Street, Covent Garden.*

ON FRAUDULENT CHLORIDE OF GOLD.

BY R. REYNOLDS, F.C.S.

The consumption of chloride of gold in photographic printing is very considerable. As many Chemists deal in the article, it is proper that they should be put upon their guard against frauds which have deceived several parties. I therefore give the results of the analyses of chloride of gold from three distinct manufacturers, which I have recently made, and although reserving the names of the guilty parties, shall probably take some future opportunity of examining their products.

All the samples referred to below were bought as chloride of gold, no mention of "non-deliquescent" being made by either buyer or seller.

The following are the results of the examination:—

"A. B."

Three "fifteen grain" bottles taken at random, without removing wrapper. Contents were as follows:—

No. 1	11.7 grains
2	11.9 "
3	12.0 "
Average	11.87 "

One "sixty grain" bottle taken as above, contents 54. "

No. 1 was submitted to analysis:—

Gold 4.4 grains = Terchloride of gold	6.75 grains
Chloride of sodium	3.80 "
Moisture and free acid	1.15 "
	11.70 "

As some makers of fraudulent chloride of gold reserve as a loophole the fact that the double chloride of gold and sodium is sold under the term of "non-deliquescent," and have the audacity to assert that no other is in the market, I give the composition which this should have had, even had it been the true double salt, although the preliminary notice shows that it was not sold as that. Terchloride of gold, 6.75 grains, would have combined with chloride of sodium 1.30 grains. Consequently there is an excess of chloride of sodium of 2.50 grains, simply diluting the mixture.

"C. D."

One "fifteen grain" bottle taken as above, contents 15. grains

Analysis.

Gold, 7.25 grains = Terchloride of gold	11.12 "
Chloride of sodium	not a trace
Moisture and free acid	3.88
	15.

"E. F."

This was a solution labelled thus: "Neutral Solution of Chloride of Gold,

guaranteed to contain 7 grains of pure gold, equal to 15 grains of crystallized 'non-deliquescent' chloride of gold."

Analysis.

Gold, 6.6 grains = Terchloride of gold ..... 10.12 grains
Or = Chloride of gold and sodium ..... 13.26 "

The solution did not contain any chloride of sodium.

Practical results.—Assuming "C. D." to be sold at a fair market price, the excess of profit over this to the maker of "A. B." is as follows, and of course the loss to the consumer is the same.

On short weight..... ..... 21. per cent.
(being average of three bottles)
On lower quality ..... 10.7 "

31.7 per cent.

As, however, "A. B." was sold at 8.3 per cent. lower price, the sum will stand thus: 31.7 less 8.3 = 23.4 per cent. excess profit, or £23 8*s.* on every £100 worth sold.

The samples "C. D." and "E. F.," although not theoretically pure chloride of gold, may be considered to be commercially honest articles. The deliquescent nature of the pure chloride renders it a difficult operation to fill the bottles with accuracy as to weight, and the varying amounts of moisture which the maker may leave in the salt, will always be a source of discrepancies in value.

The former difficulty may be overcome by sending out the solution instead of the solid chloride. I know of no reason why such solution should not be valued by its theoretical equivalent of gold, excepting that the practice of the trade has been going in another direction, and the change would involve an apparent, though not a real, advance of price, to the consumer.

At the least, purchasers should require a guarantee of seven grains of pure gold in each bottle corresponding to the gramme, whether the contents may be solid or in solution.

Leeds, December 17, 1860.

FACTS AND FALLACIES CONNECTED WITH THE RESEARCH FOR ARSENIC AND ANTIMONY; WITH SUGGESTIONS FOR A METHOD OF SEPARATING THESE POISONS FROM ORGANIC MATTER.

BY ALFRED S. TAYLOR, M.D., F.R.S.

(*Continued from page* 320.)

ARSENIC AS AN IMPURITY IN COPPER—(*Continued*).

While the presence of a sulphate, nitrate, chloride, or phosphate does not affect the process, so long as a properly diluted acid is employed for a proper time, it was found that an alkaline chlorate, even in small quantity, caused a rapid solution of the copper, and in proportion to the amount of this solvent action, a liberation of arsenic from the arsenicated copper. Owing to this chemical action of a chlorate on copper, it has been contended that Reinsch's process ought never to be employed when such a salt is present. Mr. Herapath affirms that "Reinsch's process is not applicable where nitrates or chlorates are present."* With respect to the nitrates, it admits of distinct proof that they present no objection when a properly diluted acid is used; and with regard to the chlorate, the process is unobjectionable, provided pure copper be

* Letter in the "Lancet," Sept. 3, 1859, p. 248.

used. The operator, in using copper free from arsenic, has only to saturate the liquid with the metal, and the last portion of copper put into it will effectually remove the whole of the arsenic, as well as any antimony that may be present. It is a good method of detecting minute traces of arsenic or antimony in copper; and one free from all objection, provided the hydrochloric acid and the chlorate are pure. The only circumstance which would render Reinsch's process inapplicable to the separation of arsenic in the presence of a chlorate, is the use of copper containing arsenic, like the No. 13 wire or the dial-plate or foil, as it is commonly sold. It is only the analyst, who has habitually and knowingly used arsenicated copper, who can treat the presence of a chlorate in an organic liquid, as a serious obstacle to the employment of this process.*

While, however, there is no reason to believe that the use of ordinary copper is attended with any risk in the employment of Reinsch's process, merely because it contains traces of arsenic in intimate chemical union, it may be a question whether, out of deference to public opinion, a substance containing arsenic in any form, or in any proportion, should be used for the detection and separation of this poison. In several medico-legal cases which have occurred since the universal existence of this impurity has been made known, the ordinary copper, in gauze and foil, has been employed by gentlemen who, at the time, believed they were using pure copper; they have relied for purity only in the negative mode of testing the metal suggested by Reinsch. A chemist

* In the Smethurst case, arsenic was deposited on a piece of copper-gauze, from one out of three evacuations passed by the deceased a few days before her death. The gauze employed was undissolved after boiling; and unchanged in form and substance. There was no indication that any portion of it had been dissolved; and assuming that it could coat itself with arsenic in the acid liquid, without undergoing solution (an impossibility if free arsenic was not present), it is quite certain from its small size, that it would not contain enough arsenic to give such a deposit as was ultimately procured upon it. A portion of this deposit yielded a well-marked sublimate of octahedral crystals. Some ingenious chemists suggested that a phosphate, nitrate, or chlorate, might have been present in this evacuation, have dissolved the arsenic out of the copper (without dissolving or destroying the copper itself), and thus have given rise to a fallacy. The fallacy was in their own imaginations, and based on a preconceived desire to account for a result by any theory excepting the true one; namely, that arsenic in small quantity was present in the liquid. Two other evacuations examined by the same materials yielded no arsenic (they had been passed before the symptoms resembling arsenical poisoning had supervened), yet there was no reason to suppose that these should have been deficient in the salts assumed to be present in the one in which arsenic was detected. The latter evacuation contained blood and mucus, such as usually accompany arsenical poisoning. There was no blood and but little mucus in the two evacuations from which the copper-gauze came out without any arsenical deposit upon it.

I must here notice another theoretical objection to the use of Reinsch's process when a chlorate is present, namely, that arsenic may be lost by its volatilization as chloride. This presents no difficulty: the operator, if he believes in the reality of the objection, has only to carry on the boiling in a retort, and to collect the distilled product in a receiver. The chloride of arsenic, however, is not likely to be carried over. But is this a fact, or is it a speculation? In the correspondence published in the medical journals, it was set down as a fact. On distilling a mixture consisting of seven grains of chlorate of potash, with one drachm of pure hydrochloric acid, and eight drachms of water (the usual proportions for separating arsenic), and adding to this twenty-five grains of arsenicated copper-gauze cut into fine pieces, the acid liquid collected in the receiver after the operation had continued for more than an hour, contained not a trace of arsenic. Pure zinc was placed in it, and the gas produced was passed into a solution of nitrate of silver. There was no change, even after the zinc had been exhausted. The arsenic is, in fact, converted to arsenic acid and retained in the retort as arseniate of potash, in the midst of the diluted acid and of the chloride of copper, formed at the expense of the gauze. Even if chloride of arsenic were produced, it would be deposited on the undissolved copper.

If, therefore, Reinsch's process has hitherto been avoided under these circumstances, because it might lead to the loss of arsenic,—that is an error; if, because it might introduce arsenic into the liquid under examination, then this implies that the operator must have been in the habit of knowingly using an arsenicated compound of copper for the separation of arsenic.

who does this must always incur some risk, and the result may be, that a jury will be induced to reject his evidence, simply because he has employed an article actually containing the poison for which he was seeking. Whatever explanation he may give as to the non-solution of the copper, and the proportion of arsenic found, being much greater than any arsenic contained in the copper which he used could possibly account for, it may always be suggested that he actually put the arsenic into the liquid. This equally applies to the use of the impure metal for the detection of antimony, as antimony is not an uncommon impurity in copper. To meet this objection, it will therefore be absolutely necessary, in future, to seek for copper free from either arsenic or antimony.

That this view of the facts is based on pure prejudice is undeniable, and a single chemical illustration will prove it. Standard gold contains more than eight per cent. of copper. Strong nitric acid may be boiled in a golden capsule made of this alloy without removing a particle of copper. If, now, any organic liquid containing a soluble salt of copper be placed in the capsule, and a slip of zinc be brought into contact with the gold through the acid liquid, the copper is removed from the solution, and is deposited on the gold. The capsule may be washed with water, and the film of metallic copper subsequently be dissolved in nitric acid and tested in the usual manner. No chemist would object to use the gold in such a case, merely because it contained copper; he would be governed by the fact, that under the circumstances no copper could possibly be derived from the alloy. If the substance used to detect copper was a solvent for gold, of course this mode of testing would be improper. If in a research for poisons we are merely to regard the presence of impurity in substances, without reference to the results, no analyses could be performed. It is very rare to find sulphuric acid, hydrochloric acid, or zinc, absolutely free from arsenic. Much depends on the quantity of each article used for the purposes of testing purity. Every specimen of zinc, if examined in sufficient quantity, would probably yield arsenic; although this metal may be obtained, and is obtained, sufficiently pure for use in Marsh's process. Mr. Bloxam, in a paper recently published on the detection of poisons by electrolysis,* says, "The occasional presence of arsenic in the sulphuric acid, and of both arsenic and antimony in the zinc, has always been a serious objection to the use of Marsh's process; and although the hydrogen evolved at the beginning of the experiment may be carefully examined before introducing the suspected liquid, the operator always proceeds upon the assumption that the zinc is perfectly homogeneous, and that it is impossible for arsenic or antimony which had eluded detection in the first portion of hydrogen evolved, to become apparent when the mass of zinc has entered into solution." Instances have occurred in which analysts have been satisfied with testing their acids in small quantities, while they have afterwards employed them for analyses in very large quantities. It would be difficult to draw the line between a pure and impure article, and insist upon absolute purity. There is so much inconsistency in the statements of chemists regarding these matters, that the public are mystified, and a feeling of distrust is created in all scientific processes. One chemist who has himself used arsenical copper for sixteen years, condemns its use by others when the fact is first made public; another, who professes to use electrotype copper, from theoretical notions regarding its absolute purity, has adopted, unknowingly, the constant practice of using arsenical sulphate of copper as a test for arsenic! While he would probably meet any objection to the use of this salt by asserting that the arsenic is in too small quantity to affect the results, he would, without reference to results or quantity, condemn the use of the metal itself (containing

* "Quarterly Journal of the Chemical Society," 189-560.

arsenic) for the detection of this poison. The only plan now open to an analyst is, to seek for the purest articles which he can obtain, and to test their purity by every conceivable method before he resorts to their use. If he desires to escape the censure of the public, and the uncharitable criticisms of some fellow-labourers in the same branch of research, he must go beyond the ordinary routine of testing his materials. He must look for substances, the presence of which they have hitherto ignored or disregarded; or, in the end, some of them will be found to claim credit, however unjustly, for a degree of caution which they have never themselves exercised. Owing to the want of general knowledge on such subjects, they may for a time succeed in their object, and divert public attention from their own proceedings.

"Committunt eadem diverso crimina fato,
Ille crucem pretium sceleris tulit, hic diadema."

As a rule, the purity of no chemical substance should be taken for granted in conducting medico-legal investigations; and the operator should, in fairness, always test a quantity of the substance equal to that which he is about to employ in an analysis.

Methods of detecting Arsenic in Copper.

There has hitherto been great difficulty in detecting small quantities of arsenic in copper, and this may account for the fact, that samples of copper are sold as pure, and are pronounced to be free from arsenic, when a more careful research would have demonstrated the presence of this substance. This difficulty may be appreciated from the fact, that when samples of the arsenicated copper-gauze used in the Smethurst case were forwarded to five experienced analysts in England, Scotland, and Ireland, three succeeded and two failed in detecting arsenic in it. A sample of Burra Burra copper supplied to the Royal Mint as absolutely free from arsenic, was found (by a process to be presently explained) to contain traces of that substance. Some Swedish copper which had been reserved as pure by a distinguished chemist, was found, on analysis, to be arsenical. The detection of the arsenic depends entirely on the method pursued.

The first plan which I adopted successfully, consisted in oxidizing the copper by nitric acid, evaporating the acid liquid to dryness, and then heating the residue to procure the black oxide, and, at the same time, to convert the arsenic, if present, to arsenic acid. This acid was subsequently detected in the residue by digestion in water, and the addition of nitrate of silver.

Another plan, proposed and employed by Dr. Odling, clearly showed the presence of arsenic in a small quantity of gauze, foil, or wire. The copper was entirely dissolved by the aid of hydrochloric acid and a weak solution of chlorate of potash. The surplus chlorine was removed by the gradual addition of small quantities of bisulphite of soda, and the sulphurous acid derived from this salt was removed by boiling,—the freedom of the vapour from the acid being indicated by holding in the current, starch-paper saturated with iodic acid. Reinsch's process was then applied to the liquid, and if the copper under examination contained arsenic, a deposit of arsenic was obtained in the usual way on a piece of copper.

There is no chemical objection to this method; but seeing that several substances are employed in the analysis, and that a mixture of salts resulted, it appeared to me preferable to convert the copper to a soluble chloride by digesting it in pure hydrochloric acid alone, and then from the known volatility of chloride of arsenic, to separate this from the chloride of copper by distillation. For this purpose, I found it necessary to expose the copper in a stratum of pure and concentrated hydrochloric acid contained in a saucer, the metal being partly immersed in the acid and partly exposed to the air. After two or

three days' exposure, according to the thickness of the metal, a brown liquid (a solution of subchloride of copper in hydrochloric acid) was obtained. In some experiments, the copper was entirely dissolved; in others, a portion was left. The weight of the residue, after washing and drying, deducted from the original weight employed, gave the amount of copper dissolved. The brown liquid was distilled to dryness in a flask or small retort, placed in a sand-bath, and the vapour was condensed in a flask or receiver containing a small quantity of distilled water. A perfectly clear solution of chloride of arsenic, or a mixture of hydrochloric and arsenious acids, was thus procured. When one part of this distillate was diluted with its volume of water and boiled, and a small piece of pure polished copper was introduced, the presence of arsenic was speedily indicated by the characteristic deposit on the bright metal. Another portion of the liquid was introduced into a Marsh's apparatus, or a small flask with a bent tube fixed in its neck, and by the addition of pure zinc, arseniuretted hydrogen was easily procured from it and tested. When to a third portion a solution of chloride of gold was added, and the mixture boiled, the gold was, after a time, completely deposited. The weight of the gold thus deposited supplies one method of calculating the quantity of arsenic present in the distillate.

Of the delicacy of this process for detecting arsenic, there will be, I think, no doubt on the part of those who try it; and it has this important advantage over other methods, that excepting the copper, the purity of which is to be tested, and hydrochloric acid, the purity of which may be easily determined by a preliminary experiment, no chemical is used. It is equally applicable to the detection of minute traces of arsenic in the sulphate and all the salts of copper, soluble or insoluble. It is only necessary to distil them with a sufficient quantity of pure hydrochloric acid. I had in vain sought for evidence of arsenic in some sulphate of copper by the use of Marsh's process; but on distilling only ten grains of the crystals with hydrochloric acid, chloride of arsenic was obtained in the receiver, and the presence of the poison was satisfactorily proved. In the course of the Smethurst analyses in July, 1859, Mr. Brande and Dr. Odling adopted, at my suggestion, this method of analyzing some sulphate of copper pills for arsenic, and they both expressed their satisfaction with it as a safe and delicate process.

(*To be continued.*)

ARSENIC IN COPPER WIRE.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—In your last, I find that Dr. Taylor, in a paper on the detection of arsenic, has exhibited his wrath that I should have published some comments upon his evidence in Smethurst's poisoning case; the Doctor seems to fancy, also, that he is competent to correct my errors. It is certainly possible that he may be so, but I think that his first duty is to correct his own, and, when he has done that, we shall perhaps have some confidence in his ability to teach others.

In the *Times* of May 21st, 1859, Dr. Taylor is reported to say, that in "bottle No. 21 he found it half full of a clear fluid," that he tried Reinsch's process upon it, and "found that there were 7 grains of chlorate of potass in an ounce, which was $1\frac{6}{10}$ per cent., and *that there was* A GRAIN *of* arsenic to every ounce." He further said that it was white arsenic. This evidence was most definite and positive; a *whole grain*, not a trace, not a doubtful quantity, but a whole grain, and of white arsenic, its colour even proved. Upon this evidence on oath Smethurst was committed for trial. At that trial Dr. Taylor was again a witness, and swore, as reported in the *Times*, August 18th, 1859, "I made a further test,"

(speaking of the same bottle, No. 21), "which led me to suppose that there was arsenic present in the solution, but it turned out that I was mistaken, and that it did not contain either arsenic or antimony, and that the *arsenical appearance* originally produced arose from the copper-gauze."

Now, I maintain that it is chemically impossible to find a grain of arsenic, either metallic, white, red, or yellow, in the quantity of copper which can be dissolved in an ounce of fluid with 7 grains of chlorate of potass and any quantity of hydrochloric acid. It will be found upon experiment that such fine copper-wire must have contained from 15 to 18 per cent. of arsenic! Is there, or *could there be*, any such copper-wire in existence? Yet, upon this evidence, a man was confined months in gaol, was convicted, and very nearly executed.

I now ask Dr. Taylor whether even his second and corrected evidence is true?

I am, Sir, yours respectfully,

WILLIAM HERAPATH, Sen., F.C.S., &c., &c.,

Old Park, Bristol. *Professor of Chemistry.*

REPORT OF THE RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION, AND OF THE APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

The New Element.—In noticing Professor Bunsen's investigations on spectrum analysis in the December number of this journal, we stated that this method of testing for the alkalies had led the author to the discovery of a hitherto unknown metal, belonging to the group of alkali-metals. At present, this new element has been only obtained from certain mineral waters, especially those of Kreuznach, of Dureckeim, and from the Umgemach. We now learn that Professor Bunsen has named the metal *Cæsium*. This name is taken from the Latin word *Cæsius*, signifying greyish blue, or sky-coloured, on account of the peculiarity of the two bluish lines which it communicates to the spectrum. Cæsium is stated to closely resemble potassium in its general chemical relations. It is distinguished from the latter metal, however, by the spectrum, and by the solubility of its nitrate in alcohol. It forms an insoluble double chloride with platinum.

Its discoverer has also determined its equivalent—which still further establishes its close relation to potassium—the number being 117, exactly three times the combining number of potassium.

On the Detection of Sugar in Urine.—We have received a communication from Mr. Attfield, which has also appeared in the *Chemical News*, having reference to Bœttger's test for sugar in urine. It will be remembered that this test consists in adding a few grains of ordinary trisnitrate of bismuth to a portion of the urine, then pouring in an equal volume of a strong solution of carbonate of soda, and heating the mixture. The presence of sugar is indicated by the formation of a deep brown or black colour, due to a reduction of the oxide of bismuth. Bœttger originally devised this process to obviate some of the sources of error which frequently attend the application of Trommer's test. It is well known that the presence of certain constituents of the urine, and especially of uric acid, in abnormal quantity, may cause a reduction of the oxide of copper in the application of Trommer's test, without sugar being really present. Oxide of bismuth was found to be certainly not affected by uric acid, and to that extent, therefore, might be considered as preferable to oxide of copper.

Mr. Attfield has been engaged in some experiments on the applicability of Bœttger's test. He states that it is far more delicate than Trommer's. He finds that by it abundant indications of the presence of sugar can be obtained in an aqueous solution so dilute as to give no reaction with Trommer's test. But he also finds that the presence of albumen in the urine will cause a reduction of the oxide of bismuth, and introduces, therefore, a source of error. He states that the action of albumen is far less energetic and complete than that of sugar, but that nevertheless

blackening does occur, and to a greater extent than could be accounted for by the influence of the sulphur present in the albumen. Moreover, some of the constituents of healthy urine appear to interfere to a certain extent, for the author states that "nearly all specimens of urine colour more or less the basic nitrate of bismuth." Mr. Attfield therefore objects to this test as a means of detecting sugar in urine, because of its extreme delicacy, and because other substances, and especially albumen, may produce the same reaction. For the mere detection of sugar in alkaline solutions generally, it is, however, exceedingly sensitive. The author concludes his communication by recommending Trommer's test, which he considers "for medical purposes fulfils all desirable conditions."

There can be no doubt, however, that Trommer's test is subject to certain objections. Mr. Attfield, in his paper, does not mention the test commonly known as Moore's, which consists in adding to the urine an equal volume of liquor potassæ, and boiling for some minutes, when, if sugar is present, a peculiar and very characteristic brown coloration is produced. This test is subject to many less objections than either of the above, and is now very commonly employed in the examination of urine, and for the detection of grape sugar generally. This test possesses, in addition to its being very trustworthy, one great advantage—namely, that it can be almost as readily used for determining the amount of sugar as for recognizing its presence. This depends upon the fact, that the depth of colour produced bears a strict relation to the amount of sugar present. If, therefore, a standard solution of grape sugar be prepared, and a given quantity coloured to the fullest extent by boiling with potash, upon taking an equal quantity of the urine and treating it in a similar manner, by comparing the colours and diluting until the tint is equal, the proportion of sugar present in the urine is readily arrived at.

On an Oxalate of Peroxide of Iron.—M. T. H. Phipson has shown that when hydrated peroxide of iron is dissolved in a boiling solution of oxalic acid, a deep green coloured solution is obtained, which by evaporation yields oblique prismatic crystals, having a beautiful emerald green colour. This salt consists of an oxalate of peroxide of iron, which is very soluble in water. When the crystals are exposed to the solar light, they blacken like chloride of silver; and if afterwards treated with water, they decrepitate and dissolve, leaving a yellow deposit of oxalate of the protoxide. The experiment is very striking when the direct rays of the sun are allowed to fall on a large capsule, the bottom of which is covered with crystals. The portion of salt shaded by the side of the dish remains unchanged, the other portion rapidly becomes black. The same decomposition takes place with the green solution; if it is exposed to the solar rays it slowly deposits the yellow oxalate of the protoxide, in the form of microscopic crystals; by prolonged exposure all the green salt of the peroxide is decomposed, depositing the yellow salt and leaving the supernatant liquid colourless. The green crystals of oxalate of peroxide of iron lose five equivalents of water at 100° C., at the same time becoming white; ten equivalents of water still remain, and are only disengaged at a temperature at which the salt is decomposed. To one atom of peroxide of iron the salt contains five atoms of oxalic acid. The mean of several analyses gave the following figures as representing its centesimal composition:—

Peroxide of iron	20.00
Oxalic acid	45.00
Water of combination	24.00
Water of crystallization	11.00
	100.00

These numbers lead to the formula Fe_2O_3, $5C_2O_3+10HO+5aq.$

On the Manufacture of Oxygen.—MM. Sainte-Claire Deville and Debray have been engaged in some experiments on the best means of manufacturing oxygen on the large scale. It will be remembered that some time back we gave in this place an account of the new processes which had been devised and patented by the above distinguished chemists for the treatment of platinum ores and the manufacture of platinum by fusion. In those processes oxygen gas is largely employed. The economical production of this gas, therefore, becomes an important question in the

practical working of Deville's process. The authors have experimented upon the following substances:—Manganese, chlorate of potash, chloride of lime, nitrate of soda, nitrate of baryta, peroxide of barium, sulphate of zinc, and sulphuric acid. It is particularly with reference to the two latter substances that the authors' paper refers, because they do not appear to have been previously applied to the preparation of oxygen.

The authors state that they have given particular attention to the process of M. Boussingault, which consists in the employment of peroxide of barium, and have only met with a few practical difficulties which would be readily surmounted, if anhydrous baryta could be bought in large quantities and at a low price. Sulphate of zinc, which the authors state can be obtained in very large quantities as a waste product from the galvanic batteries, when calcined in earthen vessels, evolves a mixture of steam, sulphurous acid gas, and oxygen; pure oxide of zinc remaining behind. To effect this decomposition completely does not require a much higher temperature than that necessary for the decomposition of manganese. If the sulphate of zinc operated upon be pure, a light white oxide results which may be used as a pigment. The evolved gases are passed first through a refrigerator, by which the water is separated, and then through a special washing apparatus, by which the whole of the sulphurous acid is separated in the form of a strong aqueous solution, and the oxygen obtained in a state of purity.

In operating upon sulphuric acid, the author allows the acid to enter, by means of an ω tube, a retort or worm tube filled either with thin sheets of platinum or platinum sponge, or when working with larger quantities, pieces of brick may even be employed. The apparatus is kept at a red heat, and the acid as it passes through undergoes decomposition into water, sulphurous acid, and oxygen. These three bodies are separated as in the first case. Pure inodorous oxygen and a saturated solution of sulphurous acid are the constant results. If soda-ley be used instead of water for washing the gases, bisulphite of soda saturated with sulphurous acid is obtained, which may be converted either into neutral sulphite or hyposulphite of soda.

The aqueous solution of sulphurous acid may be also utilized by passing it into the steam boiler which feeds the lead chambers of an oil of vitriol factory; the sulphurous acid will be then converted back again into sulphuric acid at the expense of atmospheric oxygen.

The author states that by these methods large quantities of oxygen may be obtained for manufacturing purposes at a very trifling cost.

ON THE UNCERTAINTY OF COMPOSITION OF THE AQUA LAURO CERASI.

BY HARRY NAPIER DRAPER, F.C.S.L.

My object in this paper is to draw attention to the very uncertain constitution of cherry laurel water, and to the importance of providing some substitute in the shape of the much more stable hydrocyanic acid. Laurel water has on its side all the claim of antiquity, and I am aware that it is not easy to persuade the practitioner who has long been in the habit of prescribing any one remedy to use another in its stead. I am also fully alive to the importance of caution in presuming upon the value of any therapeutic agent, solely from its chemical composition, seeing that we possess many very valuable remedies, about the constitution of which we either know nothing, or nothing which will serve to elucidate their mode of action. If, therefore, experience pointed out any difference in the effects of laurel water and of dilute hydrocyanic acid, a proposition to substitute the latter for the former would be unjustifiable; but as it is the opinion of all who have written upon the subject that the action of the two remedies is in every respect the same,* if we become convinced that we gain an important advantage by the change we should certainly adopt it.

The aqua lauro cerasi is not included among the formulæ of the London Pharma-

* According to Göppert, however, the poisonous action of cherry laurel water does not depend on the hydrocyanic acid which it contains, but upon some property peculiar to itself.

copœia, but finds a place among those of the Pharmacopœias of Dublin and Edinburgh. The process for its preparation is in both of these essentially the same. One pound of fresh laurel leaves are digested in two and a half pints of water, and a pint of the liquid is distilled over and filtered. Laurel water as thus prepared is nothing more than a dilute solution of hydrocyanic acid, to which the presence of a small quantity of volatile oil gives its peculiar odour and taste. The dose is by no means well fixed, being given by some authorities at from ten minims to twenty minims, and according to others ranging from ℥ss. to ℥i.

The leaves of the cherry laurel have never been perfectly examined, but of the nature of two of their constituents there exists no doubt. These are—firstly, a volatile oil, resembling in its physical properties very closely that obtained from bitter almonds, and in chemical constitution agreeing with it in every particular; secondly, hydrocyanic acid. Both of these substances are, as has been already stated, held in solution by the distillate from the leaves.

The chief cause of the uncertainty of this preparation lies in the fact that the quantity of hydrocyanated oil obtained from the leaves varies with their age. Thus Christison* found that 1000 grains of the buds and unexpanded leaves of May and June gave 6.33 grains of oil, but when they had in July attained their full size the same quantity yielded but 3.1 grains, while in the May following the quantity had diminished to 0.6 grains. Not only is the quantity of oil liable to variation, but what is still more important, the quantity of hydrocyanic acid which it contains is uncertain. It is stated by some writers to contain 2.75 per cent.; while according to others who have investigated the subject, it may exist in as large a proportion as 7.66 per cent. Christison confirms this discrepancy, he having obtained from developed young leaves twice as much acid as from old ones. Then, again, while it is well known that the leaves are constantly employed with impunity as a flavouring for articles of food, many cases have occurred in which serious results have supervened from their use in this manner. In a case cited by Dr. Paris† several children were nearly poisoned by eating a custard so flavoured. Zeller‡ states that the leaves gathered in wet cold weather yield more hydrocyanic acid than when they are collected in hot dry seasons.

From this collection of facts it will be seen that it is impossible for any two samples of laurel water to contain the same proportion of active constituent, but this is by no means the only source of error. Others which are no less conducive to uncertain composition creep in during the process of manufacture. As the whole of the oil comes over in the distillation with the first few ounces of water, if the whole product be not strongly agitated before filtration, a uniform preparation will not, even if other conditions be favourable, be obtained. Moreover, constant variations from the process given by the Pharmacopœias are frequently adopted to suit the conveniences of manufacture on the large scale. The most usual of these modifications consists in passing steam through a vessel containing the crushed leaves until the condensed vapour measures the proper quantity. More rarely it is prepared by agitating a known proportion of the oil with distilled water, as is practised in the preparation of the aromatic waters of the Pharmacopœia.

In addition to the above sources of inaccuracy, there is one other which has by no means attracted the attention which the importance of the question seems to me to deserve. It is this: Liebig and Wöhler,§ though unable in their analysis of laurel leaves to detect *amygdalin*, concur in opinion as to its existence. If this be the case —and all analogy leads to the inference that it is—the well-known action by which this body gives rise to hydrocyanic acid should surely not be overlooked, as the duration of the digestion of the leaves in water, now considered as a matter of but secondary importance, would then exercise considerable influence over the amount of active matter contained in the product. Closely connected with this part of the question are the results obtained by Pereira‖ in experimenting on bitter

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* Dispensatory, p. 592.
† Med. Jur., ii., 402.
‡ Quoted by Taylor—*Poisons*, p. 717.
§ Pereira: Materia Medica, vol. ii., part ii., p. 1782.
‖ Ib., p. 1776.

almond oil. He found that a quantity of this substance which had been carefully purified, and in which he could not detect a trace of hydrocyanic acid, gave, after having been kept for a few months, distinct evidences of its presence. If we assume —as we can scarcely avoid doing—that an analogy exists between this oil and oil of cherry laurel, another condition of change is introduced, and an increase of hydrocyanic acid in the water must result from its being kept. Experiments in this direction are, however, still wanting.

My next step is naturally to inquire in what degree this inconstancy in the composition of laurel water which we assume upon theory is borne out by experience of its effects, and we find that here facts bear us out more fully even than before. A short summary of these facts will, while occupying less space than a more detailed account, at the same time illustrate the case more clearly.

Fonquier* has given *twelve ounces* in the course of a day without any evident effect.

In 1781, Sir T. Boughton was poisoned, death resulting in half an hour by *two ounces*.†

In another case, quoted by Taylor,‡ *one ounce and a half* caused death in an adult.

Then as regards chemical analysis, Pereira (quoted by Taylor) gives the average strength as equal to a solution of hydrocyanic acid containing 0.25 per cent. Two samples which I have examined, and which were obtained from two of our first pharmaceutical laboratories, yielded respectively 0.011 and 0.009 per cent.; in fact, mere traces, the numerical value of which could not, but that large quantities were operated upon, have been stated at all.

Surely further evidence is not needed to show that this preparation is most inconstant, and that even if, on the one hand, no bad results often ensue from its administration, on the other, the practitioner must frequently experience much disappointment from the inactivity of a medicine which he believes to contain 12 per cent. of pharmacopœial hydrocyanic acid.

As it is not likely that in this country, where, from long usage, laurel water has become firmly established, the much more stable and reliable hydrocyanic acid will ever supersede it, I would suggest two methods by which the evil may be, if not wholly remedied, at least palliated, and the preparation at the same time be retained.

The first of these is, that as laurel leaves can be obtained at all times of the year, the preparation should be much more frequently made, and when made be standardized in the manner directed by the London Pharmacopœia for fixing the strength of its dilute hydrocyanic acid. In this way a uniform product, as far at least as the acid is concerned, would be obtained.

By the second method the pharmaceutist would be rendered independent of circumstances which might prevent fresh—and especially young—leaves being obtained, and moreover the proportion of volatile oil in the liquid, which by the first method could not be constant, would be always the same. I propose, then,—firstly, that the volatile oil be distilled from the leaves, and by any of the well-known means, wholly deprived of hydrocyanic acid, the subsequent formation of which might be guarded against by keeping some peroxide of mercury in the bottle which contains it; secondly, that a fixed proportion of this oil be dissolved in distilled water, and that hydrocyanic acid of known strength be added to the solution in such quantity as to make it bear an easily remembered relation of strength to the dilute acid of the Pharmacopœia.

It is clear that the time for such a change will be upon the advent of the new Pharmacopœia; but by way of example, supposing that a dilute acid of 2 per cent. be decided upon, the following would be an advantageous formula for the preparation of *aqua lauro cerasi*:—

Dilute hydrocyanic acid	35 grains.
Volatile oil of cherry laurel	5 "
Distilled water	4 oz.

This solution would contain 2 per cent. of hydrocyanic acid (which in its turn

* Richard: Elém. d'Hist. Nat. ii., 447.
† Report of the Trial of Donellan.
‡ Op. cit., p. 719.

would contain 2 per cent. of real acid), or in other words, 50 minims would be equivalent to one minim of dilute hydrocyanic acid. From the facility with which this water could be made no valid excuse could be found for not throwing it away when from any cause it had become deteriorated.—From the *Dublin Medical Press*, Dec. 4, 1860.

ON ERGOTED GRAIN.

Much investigation has taken place of late respecting the nature of ergoted grain. As the subject is one of some interest to our readers, we extract the following notice of it from the *Gardeners' Chronicle*:—

Ergot is an affection of the seeds of many species of grass, including those which are cultivated under the common name of corn, by which they are converted into a hard, dark, spur-shaped body, generally much larger and longer than the seed, though sometimes, as in wheat, not differing very materially in size. Externally it is slightly rough, varying in tint from black or brown to purplish, with frequently a white mealy wash in parts, and at first, if not permanently, tipped with a little irregular scale-like process. When examined under the microscope it exhibits, on a section of this upper portion or the parts adjacent, little spore-like bodies seated on the tips of short straight threads vertical to the surface of the mass, which are supposed to have the office of impregnation, while within it consists of a white cellular mass rich in oil globules.

Such is the condition of the plant the season in which it is produced, or till it has remained for some time on the ground, or is lightly covered with soil after the lapse of some months in a common garden-pot. A very curious change then takes place. A little pin-shaped purplish fungus sprouts in greater or less quantity from the sides, the head of which is studded with little receptacles containing linear transparent sacs filled with thread-like sporidia.

The ergot, then, as generally known, is merely a transitional form, or rather the first stage in the existence of the fungus, ending with the production of minute bodies, which are either reproductive, or, as is more probable, serve for the impregnation of the perfect fungus.

The grains of a large variety of grasses are subject to become ergoted, and ergoted grains have also been observed in the genus Eleocharis, which belongs to the order Cyperaceæ. Amongst the grasses, besides the cereals rye, wheat, and barley, may be mentioned couch-grass, darnel, rye-grass, cock's-foot, foxtail, and reed. The ergot of the reed, and blue melic (*Molinia cærulea*) so common in moors, does not produce the same fungus as that of the other grasses just mentioned, and that again which springs from the ergot of the Eleocharis is specifically distinct. The seeds of the common reed are peculiarly subject to ergot, and the heads of flowers when blown off by the wind lie upon the damp soil for some months before the ergot is properly developed. The fungus of this ergot may be raised artificially by placing the head upon damp sand covered with moss, or if they are placed with the stalks constantly immersed in water the ergot will in time produce its fungus. If any of our readers wish to see the ergot of rye, barley, or wheat developed, they have only to cover them slightly with soil about the month of April, keeping it moderately moist with rain water, and they will be pretty sure to have a crop. And they will raise exactly the same fungus from the ergot of rye-grass, except that in proportion to the size of the ergoted grain, the resulting fungus will vary in size and number.

The reproductive bodies of this fungus are extremely minute, and, as said above, appear under the form of very slender threads, which may be wafted by the wind and carried to the young spikes of corn or grass. The development of these bodies has not been observed. The first indication, however, of the disease is, the presence of a thick, sweet, honey-like, colourless matter upon the spikes, which is filled with granules, resembling somewhat those of yeast; and it is supposed that the grain becomes ergoted in consequence of their presence. This was supposed by Quekett to be the perfect fungus, and was called by him *Ergotetia abortifaciens*, the ergot being supposed to be merely a diseased condition of the grains induced by the fungus. The granules which appear at the upper part of the fungus must be distinguished. They differ in form, and probably have the function of impregnation though this scarcely admits of proof.

THE AMERICAN PHARMACEUTICAL ASSOCIATION.

The Ninth Annual Meeting of this Association assembled in the city of New York, on Tuesday, September 11th, 1860.

The President, Samuel M. Colcord, of Boston, having appointed a committee, delegates from the following pharmaceutical bodies were reported:—Massachusetts College of Pharmacy, New York College of Pharmacy, Philadelphia College of Pharmacy, Maryland College of Pharmacy, and Cincinnati College of Pharmacy.

A list of names for membership was recommended by the Executive Committee, all of which were elected. The reports of the various committees were then laid on the table.

The report of the Committee on Home Adulterations was read and adopted, and referred to the Executive Committee for publication.

In this report milk is referred to, and a series of analyses given to show the large proportion of water employed to adulterate this article. Yeast substitutes, especially that sold as a substitute for cream of tartar, owing its acidity to superphosphate of lime. Among the drug adulterations noticed are opium by leaden shot, nitrate of silver by nitrate of potassa, and chloroform by alcohol.

The President then read his annual address, in which he congratulated the Association upon the prosperous condition in which they commenced the ninth year of their labours. The policy of increasing the amount of annual contributions for the purpose of extending publications, and awarding prizes for papers of merit, was proposed as a subject worthy of attention; a general index of all the previous publications of the Association was recommended to be published in the next volume. With reference to the Committee on Home Adulterations, the President considered that the publication of the analysis of most articles, as commonly found in commerce, together with a statement of what they should be, would improve the standard of commercial quality; but how far it was advisable to publish the names of adulterating parties, he would leave the committees to report, and the Association to decide.

With respect to the Pharmacopœia, the result of their labours had been presented to the Pharmacopœia Convention, and accepted. It should, therefore, be considered a fair expression of the views of Pharmaceutists throughout the United States; and they might expect in due time a national work that should carry weight and authority sufficient to do away with all private formulæ for officinal preparations.

On the Sale of Poisons, the President stated that owing to numerous cases of poisoning the attention of the Legislature had been attracted to this subject, and it was surprising to notice how weak and inefficient had been all the laws to remedy the evil. The difficulty of framing a law to protect the community, accommodate the public, and at the same time be equitable to the dealer, was very great. He recommended this subject again to the committee, with instructions to report upon the best plan for the safe keeping, labelling, selling, dispensing, and registering sales of poisons; also to set forth specific principles on which to frame a suitable law for regulating the traffic, with a view to accommodate and protect the public, as well as pharmaceutists and druggists.

After the election of officers for the ensuing year, the papers on the questions proposed at the last meeting of the Association were read and discussed; and it was resolved that the next annual meeting of the American Pharmaceutical Association should be held in the city of St. Louis on the fourth Wednesday in August, 1861. A discussion took place on the subject of legislative enactments with reference to the sale of poisons. Some of the speakers deprecated the enumerating of poisons in the laws restraining the sale thereof.

Mr. Edward Parrish referred to the decision of the Pharmaceutical Society, that the only safeguard was in the character of pharmaceutists and those selling poisons.

Mr. W. Procter, jun., remarked that the laws usually passed to regulate the sale of poisons were more for the protection of the public than for the relief of the apothecary; that the Pennsylvania law did not limit the sale of poisons, but compelled the registration of five kinds—viz. arsenic, strychnine, morphia, corrosive

sublimate, and prussic acid, when sold by retail, and he considered that the law could be carried out with advantage.

On the subject of *Weights and Measures*, the following resolution was proposed, but, after some discussion, was rejected:—

"*Resolved*,—That the change of weights recently adopted in the Committee of the Council for consolidation and revision of the British Pharmacopœia, by which change the table of avoirdupois weight is adopted, with a new division of the avoirdupois ounce into 480 parts, to be called grains, meets the approval of this Association, and is recommended for adoption in the National Pharmacopœia."

Subsequently, the following was adopted:—

"*Resolved*,—That in the judgment of this Association it is expedient and practicable in the officinal formulas of the Pharmacopœia to abolish the use of measures of capacity, and to substitute for absolute weights and measures the term *parts*, meaning *parts by weight;* and that this Association recommends such a change as the most simple, practicable, and effective one that can be at present made."

The following are some of the questions proposed for investigation:—

Is morphia volatizable by heat without losing its narcotic properties? If not, how are the narcotic effects of opium-smoking accounted for?—To what extent can oil of benne (ol. sesami) be substituted for olive oil in pharmacy?—Arsenical pigments ; are they as extensively employed, and with such poisonous effects as has been asserted?—Is there a permanent solvent for cantharidin that will retain it in a liquid state in pharmaceutical preparations?—Is there a crystalline active principle in capsicum? or does it owe its activity to a soft resin?—What are the advantages, if any, of Conium seeds for making the Tinctura Conii, as regards uniformity of medicinal strength, and increased power, compared with the leaves? —Has the resinoid principle of colocynth, extracted by alcohol, a reliable and constant therapeutic power? and may it advantageously be employed in medicine?— Is propylamin the principle in Ergot that influences uterine contraction ? and if so, has the propylamin of commerce, derived from herring pickle, a like power?—Is there a test for the therapeutic value of extract of Cannabis Indica, based on the chemical behaviour of its resin, that may be relied upon to distinguish the active from the inert drug?—Copaiba : what are the botanical sources of this drug as at present furnished to commerce? and what is its present commercial history?—The subject of new remedies, with reference to their effect upon the progress of pharmacy, and their educational influences upon pharmaceutists.—An essay on tartaric acid, and the medicinal tartrates, in their chemical and pharmaceutical relations.— What are the best arrangements, and precautions to be observed in the preparation of soap for pharmaceutical uses?—What is the active principle of arnica flowers; and what the best process for isolating it?

MISCELLANEA.

Adulteration of Bread with Alum.—On Saturday, December 15th, five bakers, Ratcliffe, Scholl, Verge, Lambert, and Brett, were summoned before Mr. Ingham, at the Wandsworth Police Court, for unlawfully using alum in the manufacture of bread. The analyses were made by Dr. Normandy, and the proportions were found to vary from 27 to 80 grains of alum in the quartern loaf. The informations were laid under the 5th of George IV., cap. 106. The penalties inflicted were £5 and £10 each, with costs ranging from £3 5*s*. to £4 8*s*.

Poisoning by Arsenic.—The inquiry respecting the death of the boy Robert Murton has been concluded, having been adjourned from Oct. 27th. The deceased, who lodged with a labourer named Curtis, at Fornham St. Genovieve, near Bury St. Edmunds, died on the 7th of Sept., after partaking of some pudding made for his supper by Mrs. Curtis. It appeared that the deceased kept his little stock of flour in a sack, separate from that of the Curtis's. After eating part of the pudding, he was attacked with vomiting, and complained of great pain and thirst. On the following day the Curtises were also attacked with similar symptoms, and an examination of their flour, as well as of that which belonged to the deceased boy, showed that it contained arsenic in considerable quantity. Arsenic was also found on a *post-mortem* examination being made of the body of the deceased, and in the crops of several fowls which ate some of the

pudding the boy left. The evidence threw no light on the manner in which the arsenic became mixed with the flour, although it was used on the farm for agricultural purposes. The jury returned the following verdict:—"That the deceased died from the effects of arsenical poisoning, but whether administered by his own hand or the hand of another there is not sufficient evidence to show."

Poisoning by Cyanide of Potassium.—An inquest has been held by Mr. Brent, at the Duke of York Tavern, Lisson Grove, on the body of Eliza Fox Ashee Sheen, aged 19, who died from the effects of cyanide of potassium. It appeared that deceased, at the age of 17, had married the steward of a ship, who shortly afterwards went to sea. A weekly allowance appears to have been paid to the deceased, from her husband, through the office of the owners of the ship, until six months ago, when it was stopped. She was found lying on the bed; a small bottle, a wine-glass and jug, which on examination were found to have contained the poison, were in the room. In consequence of the conflicting nature of the evidence, the inquiry was adjourned.

At the adjourned inquiry it was proved that the poison was procured for the deceased by a stableman in the name of a photographic artist. The jury returned the following verdict:—"The jury find that deceased died from the mortal effects of poison, but by whom administered there is no evidence to show. The jury cannot separate without publicly expressing their regret that no clause was introduced into the bill* recently passed for the sale of poisons, to prevent the facilities which now exist of procuring (without license or restriction) such rapid and deadly poison as that which has caused the death of Eliza Fox Ashee Sheen, and who, in the opinion of the jury, might have been now living had such restriction been placed upon its sale. Further, they beg to recommend to all chemists and druggists not to supply the poison but to persons only who are known to use the same for business purposes, or upon their written orders, whose signatures should be indisputable."

Poisoning by Arsenic.—On Friday, Dec. 7th, Elizabeth Dodds was tried at Lincoln, on the charge of wilful murder of her husband, John Dodds, by administering arsenic to him. The facts of the case, as elicited at the inquest on the body, were given in our September number, page 191. It was proved that the prisoner purchased a quarter of a pound of arsenic, which it appears is known in that locality as "mercury." As a motive for the crime, evidence was adduced to show that the prisoner lived unhappily with her husband; but, on the other hand, it was proved that the deceased had been seen to wet his finger and dip it into the arsenic, which he rubbed on his gums. Mr. Stephen addressed the jury on behalf of the prisoner, pointing out the contradictory nature of the evidence adduced, and the improbability of the motive suggested. The learned judge having summed up, the prisoner was immediately *Acquitted.*

Large doses of Opium.—An inquest has been held at Aldershot on the body of Samuel Wills Hillier, paymaster-sergeant in the 9th Lancers, who had shot himself. The following is an extract from a letter he had addressed to a comrade:—"I really believe I am poison proof. About ten days ago I took half an ounce of laudanum, enough to poison a horse. It had no effect on me. After that I took eight grains of opium; again no effect, except a slight drowsiness. Then four grains of morphia; no effect. I then took five grains of liquor opii. Sedativus, with the same result. My last mode of exit is a sure one."

POISONING BY FUNGI.—DEATH OF FIVE OFFICERS.

On the 25th October, 1859, some fungi were served up at the breakfast of the lieutenants and ensigns in garrison at Corte, which one of them had collected the previous evening in a wood of chesnut-trees. Before preparing them for table, the steward had expressed his suspicions upon these fungi, but the officer insisted upon their being served up.

Six officers ate of these fungi, which had preserved their natural colour, and all remarked that they were *very salt.* Towards eight o'clock in the evening, ten hours after their consumption, the six officers were seized with vomiting. All believed

* The Bill alluded to had no reference to the *sale* of poisons. It was "An Act to amend the law relating to the unlawful administering of poisons."—Ed.

this was due to indigestion, and they did not think of the fungi till two hours afterwards. In a short time the vomiting was accompanied by colic. A medical practitioner prescribed for each of the patients an emetic draught and purgative injections.

The invalids had a bad night; the vomiting and colic continued, and they experienced cramp and a burning heat at the epigastrium. Five of the officers had then recourse to various empiric remedies which were extolled in the country. One of them, better advised, followed a rational treatment. This officer alone survived the horrible catastrophe.

Four of the invalids went into the hospital three days after the poisoning. The treatment adopted especially consisted in infusions of coffee, varied frictions, mustard poultices, and purgative injections. Three sunk at the end of three days. These invalids exhibited alternations of cerebral excitement and coma.

M. Chevrel has published four interesting notices on this case of poisoning, which he attributes to the spurious Orange Agaric (*Agaricus muscarius* of Linnæus, *Amanita muscaria* of Greville).

The Army Board of Health, in consequence of this unfortunate accident, have drawn up instructions relative to edible and poisonous fungi, which we think may be profitably consulted by pharmaceutists.

Instruction relative to Edible and Poisonous Fungi. By the Army Board of Health.

Fungi afford man an agreeable and nourishing food, and therefore, in some provinces of France, they are consumed to a great extent. The soldiers seek them, but they confound, unfortunately very often, the poisonous fungi with edible ones, and thus expose themselves to the gravest accidents. It is important, therefore, that they should be taught, as far as science is able, by simple characters, to distinguish the wholesome from the injurious species, and at the same time be made acquainted with the proper means to combat the poisoning. It is with this view that the Board of Health have drawn out the present instruction.

1. *Distinctive characters of Edible and Poisonous Fungi.*—Some general characters will enable us in most cases to distinguish edible from poisonous fungi. Thus, edible fungi grow usually in elevated and airy places, in waste ground; whilst the dangerous species are found in woods and in dark damp places. The edible species have a compact, brittle flesh; while those with a soft and watery flesh should always be rejected.

Wholesome fungi have an agreeable odour, although this character is also found in some injurious species. A powerful and disagreeable odour is the certain indication of noxious qualities.

We ought at once to reject fungi which secrete a milky juice, and those which present an acrid, astringent, bitter, acid, or salt taste.

We should suspect fungi which have a bright tint, red, green, or blue, of which the gills are coloured brown or blue. The flesh of the edible species is in general white; nevertheless, a beautiful red fungus, the *orange agaric*, is considered as the finest and most delicate species. Wholesome fungi do not change colour by contact with the air after being cut; those of which the flesh then acquires a brown, green, or blue tint, are poisonous. We ought to regard as dangerous those which insects will not touch.

It is proper to abstain from fungi, whatever may be their apparent qualities, when they have attained their full development; when they exhibit any signs of change; when even they have been collected more than twenty-four hours—the poisonous properties being capable of development when the fungus grows old or dries up.

We thus see that the negative characters have more value than the positive ones; and in rigorously applying the rules which we have now made known, we should undoubtedly throw aside some edible species, an error which is not detrimental, but we should be certain to reject all those species which could act injuriously.

It is important to be cautioned against the widely-spread notion, that it is easy to distinguish wholesome from noxious fungi, by submitting them to such tests as the following:—

If we apply a silver piece or plate upon a poisonous fungus, it is blackened; in

cooking them with white onions these will blacken, if the fungus is of a poisonous nature.

These tests have no value, and the absence of the above indications proves nothing in favour of the good quality of fungi.

In *résumé*, we see that science does not afford us any certain character which absolutely establishes a clear line of distinction between edible fungi and those which are poisonous to a greater or lesser degree. It is better for us to abstain altogether from them, when there exists the slightest doubt of their quality.

2. *Preparation of Fungi.*—When we are about to use fungi of which there is the slightest doubt as to their quality, it is important before their preparation to wash them thoroughly with water acidulated with vinegar. For that purpose they should be cut into slices, and left to macerate for an hour in the vinegar and water, composed of a litre of the latter to three spoonfuls of the former. They should be afterwards washed with boiling water, and then cooked. The result of experience is, that the most dangerous fungi lose their poisonous properties when they have been previously treated with vinegar and water. But it is difficult to determine the moment when the poisonous principle is thus carried away.

3. *Symptoms of Poisoning by Fungi.*—The symptoms indicating this poisoning vary according to the species of fungi which have been taken, the quantity consumed, and their mode of preparation. Their action is manifested generally by vertigo, nausea, vomiting, gastralgic and intestinal pains, which very soon become continuous, and assume a great intensity. There is much thirst. Blackish, mucous, and bloody stools, accompanied by tenesmus, are frequently added to these first symptoms. We observe commonly cold perspirations, partial or general convulsions, and coldness of the extremities. The pulse gradually becomes weakened. It is followed sometimes by delirium, either alone or alternating with coma; at other times the intellect remains perfectly clear. Strength decreases, the cheeks become sunken, the stomach retracted, the body assumes at times a bluish hue, and death ordinarily takes place at the end of two or three days.

The series of these grave accidents are not developed till seven, eight, or ten hours after the repast, when the process of digestion is finished, and the poison has been carried into the circulation. It is important, then, when we observe vomiting of a suspicious nature, to inform one's self not only of the food taken at the last repast, but also of that at the one which preceded it.

4. *Treatment of Poisoning by Fungi.*—The first indication to fulfil, at whatever period one is called, is, to assist the evacuation of the fungi by the aid of an emetic and purgative administered at the same time. For this purpose dissolve in half a *litre* of hot water twenty-five *centigrammes* of the emetic, and twenty *grammes* of sulphate of soda or magnesia; then administer this solution in lukewarm portions to the patient, and tickle the back of the throat with the finger or with the barbs of a feather.

When it is suspected that a portion of the poisonous principle has arrived in the intestines, it is desirable to assist the action of the above medicines by the administration of purgative injections.

Experience has demonstrated how important it is to continue the use of these remedies for a long time, even when we believe the digestive organs to be entirely cleared of the poison.

Tannin dissolved in milk and water is recommended at all periods of the poisoning concurrently with the emetics, but especially after the employment of them has ceased. We can replace milk by white of eggs beaten up and mixed with emollient drink or even with water.

After the complete expulsion of the poison, it is expedient to employ mucilaginous demulcent medicines, ether draughts, emollient fomentations, baths, and generally, all means should be adopted to ease the pain and subdue the inflammation.

External revulsives, such as mustard poultices, stimulating embrocations upon the members and trunk, &c., are means which it is necessary not to neglect whilst the reaction is incomplete, and they should be continued energetically.—*Extract from a Memoir by Drs. Lallemant and Chevrel. Journal de Pharmacie et de Chimie*, November, 1860.

THE GREAT PARAFFIN CASE.

E. W. Binney & Co., *versus* The Clydesdale Chemical Company.

(Before the Lord President of the Court of Session and a Jury, in Edinburgh.)

Issues to be tried :—1. Whether, between July, 1855, and 13th March, 1858, and during the currency of the said letters patent, the defenders, or any of them, did, at their works at or near Cambuslang, wrongfully use the invention described in the said letters patent. 2. Whether the invention described in the said letters patent is the original invention of the said James Young. 3. Whether the invention described was known and publicly used in the United Kingdom before the date of the said letters patent.

It is impossible to give at length all the extracts and specifications referred to by the defenders. The most important were the patents of Brown and Belford (1853), worked by the defenders, and in the use of which the infringement was alleged to consist.

Dr. Penny said, I am aware that paraffin was first discovered in 1830, and extracted from tar, by Reichenbach. Until Mr. Young published his specification, there was no method known by which paraffin could be obtained *commercially*. Mr. Young inaugurated a new manufacture. None of the extracts produced would point to it. The patents preceding Mr. Young's do not anticipate it. Brown and Belford's are, in my opinion, substantially the same as Young's. I have examined other coals besides Boghead, and I think that Young's process could be advantageously applied to Wemyss, Brown Methel, Capeldroe, &c. &c.

Cross-examined.—There is some discrepancy of opinion as to whether Boghead is a true coal. It was not known before 1849 that the products obtained by the low temperature from coal were so totally different from gas tar. Kimmeridge shale oil differs essentially from Mr. Young's. (Dr. Penny's further evidence consisted chiefly in cross-examination on the various extracts and patents, but he adhered to his previously expressed opinion.)

Dr. Odling considered Mr. Young's a novel invention, and that the novelty lay in the commercial production of paraffin from coal. He thought none of the extracts or patents produced anticipated it. Brown and Belford's patents used all the points belonging to Young's. (Dr. Odling was cross-examined, but his evidence was not shaken.)

Mr. Young, the patentee, detailed the steps by which he was led to his discovery. He was not led to it by any of the extracts produced. Most of them would have misled him. He did not claim the process of purification. What he considered original and novel in his patent was the *economic* production of paraffin and paraffin oil from coal.

Cross-examined.—Had tried a great many varieties of coal. Some answered nearly as well as the Boghead. Had seen and heard nothing of the distillation of shales before his discovery, and was not taught how to proceed in it by Sir Robert Kane's book.

Dr. Playfair considered Mr. Young's specification the first account which would enable paraffin to be *commercially* produced from coal. Did not think any of the extracts produced would have directed any one to the discovery. Thought Hompesch's patent differed materially from Young's. Lord Dundonald's process produced tar, which was essentially different from Young's oil. The passage from Sir Robert Kane's book applied more directly to the manufacture of gas.

Sir R. Kane considered the obtaining from coal of paraffin and of *oils*, as distinguished from *tar*, to be an original discovery on the part of Mr. Young. Chemists generally were aware that paraffin had been found in coal tar—that the proportion of liquids produced was greater as the temperature (within certain limits) was lower; but he still considered that the producing a paraffin yielding oil in commercial quantities by the process patented by Young was perfectly new. Certainly his knowledge of chemical writings (of Reichenbach, &c.) would not have told *him* how to do so.

Dr. Hofmann thought the novelty of Young's patent consisted in distilling a particular kind of coal at a particular temperature, with a view to obtain paraffin and

paraffin oil. Was decidedly of opinion that that was a novelty in 1850. Reichenbach's remarks did not, in his opinion, point to the process. He had distilled Dorsetshire shale, and obtained from it an oil much resembling that from Boghead, but it contained very little paraffin. As a matter of theory, he did not think it could be done commercially.

Dr. Letheby thought the novelty of Young's process consisted in the gradual application of the heat, and not allowing it to exceed a red heat. That was proved by his being the first to obtain paraffin in quantity. Did not think any of the passages quoted pointed out the process. The patents of Dubuisson, &c., did not anticipate it. The patents of Brown and Belford, he thought, were merely repetitions of Young's. He thought that Hompesch was wrong in calling his method a gradual application of heat.

James Neilson had distilled cannel coal from 1816 to 1846, but had never heard of paraffin being produced from it before Mr. Young's patent.

George Anderson was a clerk, from 1820 to 1822, with Messrs. McAdam, who worked Lord Dundonald's process at Muirkirk. They obtained coal tar and a species of "spirit." The works were discontinued in consequence of the competition of the gas works.

Mr. E. Meldrum, partner with Mr. Young, described the commencement of their works. They had used Boghead almost entirely, but some other Scotch cannels might have been used. Brown Methel was almost as good as Boghead. Their oil was perfectly different from coal tar, and the substance they sold as naphtha from coal naphtha.

Hugh Bartholomew is manager of the Suburban Glasgow Gas Works. Had used cannel coal for the works since 1843. Never heard of any liquids produced, except tar and gas water, until Young's patent. Thought it an entirely new and very valuable manufacture. He estimated that you got the light for 1*d.* from the paraffin oil which with sperm candles would cost 1*s.* 4¼*d.* He had examined several samples of coal (Wemyss, Methel, &c.), and was quite satisfied that Muirkirk, the *worst of them*, one ton of which gave 42 gallons crude oil, could have been profitably used. Brown Methel gave 84. Mr. Napier assisted him.

James Napier, practical chemist, had examined with the last witness Muirkirk coal, which gave 42 gallons of crude oil per ton ; Brown Methel, 84 ; Black Methel, 60 ; Capeldræ, 80; Lesmahago, 78 ; Wemyss, 68. He had no doubt, as a practical man, that these coals could be profitably worked by Young's process.

Dr. Murray Thomson had experimented on several cannels, and found that when they were heated suddenly to a low red instead of gradually, they gave much less oil, and that oil contained much less paraffin. Had been applied to to make some trials of coals on Mr. Young's plan. He did so on a small scale. They yielded from 20 to 40 gallons of refined oil per ton. Boghead gave him 51. He tried also the sudden application of a full red heat. That gave a much smaller produce. Any one could do the same on the large scale.

Mr. Landale, mining engineer, proved the length of time for which Lesmahago, Methel, and other gas coal had been worked.

Mr. Clift, manager to Mr. Bethell, was well acquainted with coal tar, and considered paraffin oil perfectly different. He visited the Wareham works in 1853. Mr. Bethell purchased about 2000 gallons of oil in 1851. They rectified it and mixed it with their coal naphtha, but it injured it. He experimented with the shale himself. His products had a very bad smell. Mr. Bethell declined to take the works (of which he had an offer) in consequence of his advice. He had worked with Boghead himself. He got a crude oil very like Young's. His object was different.

Wm. Homersham, engineer, superintended Braithwaite's shale works in 1849. Distilled about 100 tons altogether. Got about six gallons crude oil to the ton. It was not purified in any way. He conducted the distillation at a high temperature. The works were stopped in 1850, because the article produced was unsaleable.

Several witnesses were then examined who had been employed in the defenders' works. They all agreed in stating that a low red heat—in the words of one, "a cool, moderate, black-red heat"—was employed.

Dr. Stenhouse spoke to the essential differences existing between ordinary coal

naphtha and Mr. Young's, and added that he considered Mr. Young's unquestionably a novel invention.

Professor Anderson spoke to Mr. Young having exhibited paraffin at the Exhibition of 1851.

The defenders called

Mr. Dugald Campbell.—Had had much experience in distilling coal. Had been shown paraffin and paraffin oil in 1847 by Mr. Cooper. They were obtained from Kimmeridge shale. He obtained them afterwards himself from it. An oil was sent him from Braithwaite's shale works. It was nearly the same as the crude oils of pursuers and defenders, and could be made to yield the same products. He did not see any novelty in Mr. Young's process. It was Reichenbach who first informed the public that paraffin oil was produced by the distillation of coal at a low temperature. He distilled three tons of Muirkirk coal by Lord Dundonald's process, and obtained a tar from which he separated paraffin and paraffin oil. He had got a drying tar by Young's process. It was generally known in 1847, that the lower the heat, the greater the liquid produce. Paraffin oil is eupione.

Dr. Taylor agreed with the last witness as to the want of novelty. He thought no one seeking to procure paraffin would have worked at any but a low temperature. He should have expected to decompose it all by a high temperature. All the fats were so decomposed, and he should think paraffin was no exception to the rule.

Professor Brande agreed generally with the last two witnesses.

Mr. Heathfield described his experience in distilling shales at Wareham.

Mr. Evans described the distillation of cannel coal at the Chartered Gas Works and the character of the tar.

Mr. Carlisle, the defenders' manager, spoke generally to the conducting of their works, and the resemblance of their process to Lord Dundonald's.

The *Lord President*, in summing up, pointed out to the jury that a patent might be taken for a substance already known, if the new process gave it more economically, or in greater quantity. If the obtaining paraffin by raising bituminous coal to a low red heat gradually, and keeping it at that heat till the volatile products came off, was a novelty, then a patent might be taken for it, and the first and leading point in dispute was, was this a novelty or no? No question but paraffin was known before Mr. Young's invention. He did not think they would have much difficulty in deciding that the general law as to distillation was known also; indeed, he thought there were few things in any science that could not be reduced to a general law, but that did not exclude a novel application of that law. Now, whether this discovery of Mr. Young's had been pointed out so that any one might have done it, was for them to determine. As to the distillation of the shale at Wareham, the gentleman who went down to take charge said they distilled at a high temperature, which Mr. Young said was not his process. Also, the result was a product that no one would buy, whereas Mr. Young's every one was ready to buy. They would judge whether that was an anticipation. (After referring to Sir Robert Kane's work, and Dubuisson's and Hompesch's patents, the learned Judge proceeded): The essence of Lord Dundonald's patent was the admission of the external air to obtain coal tar, pitch, and coke. They would have to say if that was an anticipation or no. But if it disclosed something different and the defenders did nothing but what it disclosed, they must decide whether they were infringing Mr. Young's patent in doing substantially the same thing by a different apparatus. Again, they had been told that Mr. Young's process depended on the Boghead, but evidence had been given that other coals which were in the market before would answer the purpose. If they thought there was nothing new in this treatment of bituminous coals, there was an end of the case. If they thought that the same thing was publicly done at Wareham, that, of course, would amount to a publication; and, again, if they thought the mode of working of the defenders was substantially different from Mr. Young's, then, although they might get the same products, that was not an infringement. If they thought Mr. Young's was a novelty, and the defenders' process substantially the same, then that was an infringement.

The jury, after a short retirement, returned with a verdict, finding unanimously for the pursuers on all the issues.

REMOVAL OF NUISANCES.

PARAFFIN OIL.

On Monday, Dec. 17, Mr. John Austin appeared before Mr. Yardley, at the Thames Police Office, for the third time, in answer to a summons taken out by Mr. John Stevens, Inspector of Nuisances, charging the defendant with permitting a nuisance on his premises by a deposit of paraffin oil partly manufactured, and other oleaginous substances, which were injurious to health. Mr. Yardley, in commenting on the evidence, stated that, notwithstanding the great display of witnesses, including vestrymen, doctors, and chemists, there was very little to dispute about. It was clear from the evidence given that there were various degrees of offensiveness experienced by the witnesses. It was on the state of the premises after the discontinuance of the manufacture of paraffin oil that he had to deal with. The only fact admitted on both sides, that it was found necessary to cover the materials in the hogsheads and the casks with water, proved there was an effluvium arising from them, and it was impossible to gainsay the strong evidence for the prosecution, as to the effects of the noxious effluvia which those persons traced to the defendant's premises. On the strong facts sworn to, he could not say the substances on the defendant's premises were not offensive, and he should make an order upon the defendant to remove them, and to pay five guineas to the vestry of Mile End Old Town, for costs.

BOOK RECEIVED.

The Literary and Scientific Register and Almanack for 1861. By J. W. G. Gutch, M.R.C.S.L., &c. London: W. Kent & Co., Paternoster Row.

The character of this compendium of useful information is now too well known to need any introduction. The present issue differs from its predecessors only in the alterations which the progress of scientific research had made necessary.

TO CORRESPONDENTS.

R. A. P. (Brighton).—(1.) Apply by letter to the Secretary, Bloomsbury Square. (2.) The medicinal use of cod-liver oil in this country is stated by Pereira to have been recommended by Dr. Percival in 1782. (3.) No. (4.) Yes. (5.) The difficulty alluded to does not exist—the avoirdupois pound is equivalent to 7000 troy grains.

A Druggist's Assistant (Sloane Street) thinks that if the early-closing movement was more generally adopted in the drug trade, the young men would perform their duties with more satisfaction to their employers, whom he thinks should promote the cause.

A. G. R. (Edinburgh).—We know of no formula for solution of perchloride of iron and glycerine; a mere mixture of the two would answer the purpose.

M. P. S. (London).—There is no authorized formula for "Tinctura Pareiræ Composita."

Alpha (Liverpool) should consult a medical practitioner.

An Associate (London).—There would probably be no objection, if well prepared for the Major Examination. Application should be made to the Secretary, 17, Bloomsbury Square.

Delta (Coventry).—*Kamala.* Vol. xii., page 589; vol. xviii., page 405.

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, Elias Bremridge, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. Churchill, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.
SECOND SERIES.

VOL. II.—No. VIII.—FEBRUARY 1st, 1861.

ADULTERATION OF FOOD ACT.

The Act passed last session, for preventing the adulteration of articles of food and drink, is attracting rather more attention than it did in the first instance. In some districts, both in London and in the country, public analysts have been appointed; in others, memorials have been presented to the municipal authorities, urging them to adopt the requisite means for putting the Act into operation; and in others, again, the local boards having the power of appointing analysts, have been seeking for candidates for the appointment. The result of what has hitherto been done, however, affords by no means an encouraging prospect for the future. The prevailing opinion seems to be that the measure will altogether prove a failure—that it will not accomplish what was contemplated in passing it, and that to the extent to which it is capable of being worked, it is likely, if put into operation, to produce as much evil as good.

The Act was intended to deal with two particular classes of transactions. The first of these comprises the sale of articles so adulterated as to prove injurious to health. It is enacted, "Every person who shall sell any article of food or drink, with which, *to the knowledge of such person*, any ingredient or material injurious to the health of persons eating or drinking such article, has been mixed," shall be subject to a penalty not exceeding five pounds. This clause secures the dealer against the infliction of penalties for selling an article adulterated without his knowledge, but it seems almost to preclude the possibility of convicting the parties guilty of this, the worst description of adulteration. Of course the unprincipled dealer will purposely remain ignorant of the nature of the adulteration to which the article has been subjected. The second class of transactions contemplated in the Act, is that in which articles are sold *expressly warranted as pure or unadulterated*, which prove to be adulterated or impure. Here again the Act is easily evaded, by declining to give any warrants. The dealer who sells an article which he knows to be adulterated, is not likely to expose himself to the penalty; while he who wishes and intends to sell none but pure and unadulterated articles, should he venture to warrant them, would run a greater risk than many would be willing to incur.

As far as the infliction of penalties for the sale of adulterated articles is concerned, therefore, the Act must prove to a great extent inoperative.

But the Act contemplates punishment not only by fine but also by public exposure. If any person, *after being convicted*, shall again commit the like offence, the justices before whom the case has been proved, may cause the offender's name, place of abode, and offence, to be published in such newspaper, or in such other manner as the justices may think desirable. This publication, however, is only to follow the second conviction, and we have seen how difficult it will be to obtain any conviction.

Dealers may sell articles so adulterated as to prove injurious to health, and unless it can be proved that they do this *knowingly*, the law will not affect them. They may sell adulterated articles that are not injurious to health to any extent, and if they do not warrant them to be pure and unadulterated, they cannot be convicted.

It may be asked, under these circumstances, what good may be expected to result from the operation of the Act? Probably, if a competent body of analysts were appointed throughout the country, the adulterators would, to some extent, be kept in check, the most flagrant cases of adulteration would be brought to light, and, even if there should be no conviction, the hearing of cases before the magistrates would cause sufficient publicity to open the eyes of the public.

But even with reference to this application of the Act difficulties appear to exist.

In the first place, it is left optional with parochial and other local authorities to put the Act into operation or not, in their several localities, as they think proper. The vestries, &c., *may*, for their respective districts, appoint or remove one or more persons possessing competent *medical*, *chemical*, and *microscopical knowledge*, as analysts of all articles of food and drink purchased within such districts, and *may* also provide a convenient office, &c., for such analysts, and *may* pay to such analysts such *salary or allowance* as they may think fit.

Hitherto, the number of parishes or districts in which the local authorities have thought proper to appoint analysts under the Act is, we believe, comparatively small, and even where such appointments have been made but little appears to have resulted from them. Any good which the Act is likely to produce must depend upon these appointments; and here another difficulty arises, for the duties required to be performed by the analysts are of a very responsible nature, and involve special qualifications. Where are the men to fill them?

There is a class of men who endeavour to make the agitation of this subject a source of profit, who have been seeking about for cases, construing everything that does not come up to their assumed standard into a case of adulteration, causing unnecessary alarm in the minds of those most susceptible of such influences, creating indignation among those who consider themselves unjustly accused or suspected, and producing a tendency in men of calm judgment to counteract this injudicious agitation. These are not the men to be appointed public analysts.

In some of the London districts the authorities have been advertising for legally qualified medical practitioners who would be willing to perform the duties of the office for the fees provided by the Act. These fees range from two shillings and sixpence to ten shillings and sixpence for each analysis. Now, it is obvious that if the appointment of analysts be made to any extent on these terms the measure must prove a miserable failure. There are, no doubt, many medical men who possess the requisite qualifications, but are there not also many men, not legally qualified medical practitioners, who are equally eligible, and would be even better calculated to perform the duties of the office efficiently? It is not surely claiming too much for the members of the Pharmaceutical Society, those especially who have been admitted by examination, to say that there are among them many who are well qualified to fill this office, and in several instances that have come under our notice such have been appointed. But from whatever class of men the appointments are made, it is absurd to expect that the duties of the office shall be efficiently performed for the fees named in the Act. It was obviously intended by the Legislature that these fees should be received in addition to a fixed salary. Any attempt to get the work done for the mere nominal remuneration specified in the Act would inevitably bring the whole scheme into disrepute, by causing it to be undertaken, if at all, by incompetent men, or, if otherwise, to be carelessly or imperfectly performed.

In the city of London, where the Act was put into operation several months ago, and Dr. Letheby, the active and efficient officer of health for that district, appointed analyst, the working of the measure has been tried under the most favourable circumstances, but the result is not considered to have been successful; indeed, the only advantage which the advocates for the continued trial of the measure seem now to anticipate, is that which may possibly result from the publication of the names of parties from whom adulterated articles have been purchased for examination by the analyst. It has been shown, however, that the dealer in adulterated articles may avail himself of this method of advertising under the Act in another way. He may employ a friend to purchase of him an article known to be perfectly genuine, and this being made the subject of examination by the analyst, and of inquiry before a magistrate, his name will be published as a dealer in unadulterated articles, and he will get a chemical certificate at a very small cost.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, *2nd January*, 1861,

Present—Messrs. Bird, Edwards, Hanbury, Haselden, Hills, Morson, Squire, and Waugh,

The following were elected

MEMBERS.

BATH .....Kent, William Frederick
CAMBERWELL.....Lomas, Joseph Wilding
DONCASTER.....Dunhill, William Workman
LONDON .....Johnson, Benjamin Musgrove
OXFORD .....Walsh, Edward

MAJOR EXAMINATION, *15th January.*

Bass, James .....London
Gregory, George Henry .....Crediton
Sanger, William Albert .....London

MINOR EXAMINATION.

Brew, John Archer.....Brighton
Brown, Francis James .....Weston-super-Mare
Browne, Henry Robert .....Deptford
Fidel, Albert James.....Oxford
Hasselby, Thomas John.....Goole
Holloway, Thomas Henry .....Sydenham
Morgan, David.....Aberayron
Stevens, Henry William .....Colchester
Towers, Robert .....Ulverston
Utley, Alfred .....London

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS.
Dyson, Walter	Mr. Taylor	Pendleton
Knight, Benjamin	Mr. Maggs	Yeovil

PHARMACEUTICAL MEETING.

Wednesday, January 2nd, 1861.

MR. T. N. R. MORSON, PRESIDENT, IN THE CHAIR.

DONATIONS TO THE LIBRARY AND MUSEUM

were announced as follows:—

The Journal of the Society of Arts. From the Society.
The Photographic Journal. From the Society.
The Chemist and Druggist. From the Editor.
The Chemical News. From the Editor.
British Journal of Dental Science. From the Publisher.
The Veterinary Toxicological Chart. From Professor Morton.
The Manual of Veterinary Pharmacy. From Professor Morton.
Illustrations of the Nueva Quinologia of Pavon. Part 6. From J. E. Howard, Esq.
Prosperi Alpini de Medicina Ægyptiorum. From Mr. Joseph Ince.
Coal, Petroleum, and other Distilled Oils. By A. Gesner. From the Publishers.
Proceedings of the American Pharmaceutical Association, 1859. From the Editor.
A Specimen of the Musk Deer, with the Musk Pod *in situ.* From Messrs. Peake, Allen, and Co.

THE PROCESS OF DISPLACEMENT.

The further discussion of this subject, which was adjourned from the previous meeting, was resumed by the Chairman. He said the process of displacement possessed very decided advantages in many cases, and it obtained extensive practical application; but as it was necessary that the substances to be thus treated should each be reduced to a particular state of division, it was sometimes difficult to determine the conditions most suitable to the successful application of the process. It could not, in the present state of our knowledge, be made to replace the old process of maceration, but its use would probably be extended, as the best means of applying it became better understood.

Mr. Sandford placed on the table two samples of tincture of rhubarb, one made by maceration and the other by percolation. In the latter case the rhubarb was more completely exhausted than it was in the former.

Mr. Waugh had been acquainted with the process of percolation for nearly forty years, as the process adopted in making Scotch ale. One of its great recommendations was its economy, for all the soluble matter taken up by the liquid could be recovered. Thus, if ten gallons of spirit were put into the percolator, ten gallons of tincture could be obtained, which could not be said with reference to the process of maceration, as a certain portion of the tincture was in that case always left in the marc. Mr. Sandford had raised the question of the propriety of using a tap to the apparatus. He thought it advantageous in some cases, as it enabled the operator to control the rate of percolation, and to exhaust the solid substances with a smaller quantity of liquid than would otherwise be required.

Mr. Sandford said his objection to the use of a tap was founded upon the opinion he had formed, that if the ingredients were properly packed, it was unnecessary to check the flow of the liquid, and that the use of the tap encouraged careless manipulation.

Dr. Redwood thought that what was most wanted at the present time was an indication of the relative advantages in particular cases of the two processes of percolation and maceration. In some instances the advantages of percolation were very decisive, while in others they were either doubtful or negative. For the process of percolation to succeed well it was generally necessary for the solid substances to be reduced to a finely divided state, and with some substances when reduced to this state it was difficult, if not impossible, to cause the liquid to percolate. No one could doubt the perfect applicability and the advantage of the process of percolation, in the case of ginger, for example. The ginger could be operated upon with perfect facility even when reduced to the finest powder, and the powder might be tightly packed in the apparatus. It yielded, by this process, the whole of its soluble matter to an equal weight of spirit, so that a pound of ginger could be perfectly exhausted with a pound of rectified spirit in about two hours, and the whole of this tincture recovered. Ginger might be taken as a type of the class of substances for the exhaustion of which, by means of spirit, the process of percolation was especially applicable. There were other cases, however, in which its advantages or even applicability were less obvious, and some in which maceration appeared to be preferable. It was very desirable that a careful set of experiments should be made to determine the relative advantages of the two processes. It appeared from the statement of Mr. Deane at the previous meeting, that in the case of poppy-heads, which contained much cellular matter, complete exhaustion was not readily effected by percolation. The liquid, in such case, was absorbed into the cells where it was locked up, and this portion of liquid was not removed by displacement, but only slowly by diffusion. Vegetable substances abounding in cellular matter, especially such as could not be readily reduced to a finely divided

state, could not therefore be operated upon by the displacement process with the same advantage as those substances, such as ginger, which did not present that character. The state of division of the solid substance operated upon, was important. For the perfect success of the process there should be minute division, but some substances when in fine powder resisted percolation, so that it was necessary to operate upon them in a less finely divided state. This was the case with nut-galls when percolated with ether. He had latterly met with an instance which served forcibly to indicate the great advantage of the process of percolation in a case in which it is strictly applicable. Having occasion frequently to prepare *liquor potassæ* in different ways, he found that a solution in which the carbonate of potash was not yet completely decomposed by the hydrate of lime, if turned into a calico filter with the precipitate, and allowed to percolate through the precipitate, was rendered perfectly caustic much more quickly than could be done by shaking the ingredients together. The preparation of soap-makers' ley, was, in fact, one of the operations in which percolation was first practically applied with advantage. Mr. Wood, observing the effect of filtration in promoting the decomposition of the carbonate of potash, had suggested the preparation of *liquor potassæ*, by putting the lime into a displacement apparatus, and simply allowing solution of carbonate of potash to percolate through it. This process, although slow, was found to yield a solution perfectly free from carbonic acid. The effect here, however, was far more complete and satisfactory than that which occurred in the preparation of some tinctures and other preparations in which, hitherto, difficulties had been experienced, and as already stated, it was, he thought, very desirable that a classification should be made, founded upon carefully conducted experiments, of the cases in which one or the other of the two processes referred to was found most convenient and advantageous.

Mr. Robins said he had found the process of percolation answer very well in the preparation of *Liquor Cinchonæ*, as the soluble matter of the bark was obtained by the use of a smaller quantity of water than was required in the process of maceration. He had also used percolation with success in the preparation of acetic extract of colchicum, and with very marked advantage in making a strong tincture of orris root. Half a pound of the powdered root was exhausted with sixteen ounces of spirit, and by using water to displace the spirit, he had recovered fifteen and a half ounces of tincture.

A Member thought the process of maceration a good and convenient one in many cases, and that its advantages ought not to be overlooked; but he also considered that percolation possessed some important recommendations. Difficulties, it was true, sometimes beset the latter process, but these could generally be overcome. In the case of substances that resisted percolation, on account of their resinous or mucilaginous character, the difficulty was in great measure removed by mixing them with coarse sand. He had generally found the colour and other characters of tinctures, when made by percolation, to be better than when made by maceration. Even poppies, if well dried and powdered, could be efficiently exhausted by percolation.

Mr. Squire thought the body of chemists and druggists were hardly prepared for the adoption of percolation as a general process for the preparation of tinctures. It was admitted on all hands that for the successful application of this process, special knowledge was required for each particular case, and it did not appear that all the conditions required to be observed were yet fully understood. In fixing upon a process to be adopted in the Pharmacopœia, it should be ascertained that it would be likely to be well and efficiently carried out by those who would have to apply it. There was a process known as Dr. Burton's process, which he thought deserved consideration, and which appeared to present fewer practical difficulties than were experienced in percolation. He

was not so great an advocate as Mr. Sandford was for the process of percolation, but thought much benefit might result from the publication of the experiences of practical men with reference to it.

Mr. Haselden thought the process of percolation or displacement had its advantages and disadvantages. Thus, he had found that in the preparation of concentrated infusions, some were better and others not so well made by this process as compared with maceration. With cascarilla and calumba it answered perfectly, but not, according to his experience, with the compound infusions of gentian and orange-peel.

Mr. Brown thought the fact that substances to be operated upon by percolation must be reduced to fine powder, constituted an objection to the process, as many substances were injured in quality in the process of drying, which had to be adopted before powdering them.

The Chairman remarked, that the state of division to which the substances operated upon were reduced, and the form of apparatus employed, had an important influence upon the result, and when those and other conditions required to be observed were better understood than at present, he believed the process of percolation would be found to be applicable to all cases in which solutions were made by maceration for use in Pharmacy.

Mr. Hills was not prepared to admit that percolation was a suitable process to be generally adopted. It had its advantages and its disadvantages. It was a very convenient and efficient process in many cases, especially where concentrated solutions were required, or where they were required for use in a short time, but he thought if they had to make all their tinctures in that way, much difficulty and inconvenience would be experienced.

DESCRIPTION OF THE HIMALAYAN MUSK DEER, ITS HAUNTS, AND THE METHOD OF TAKING THE MUSK;

Accompanying a stuffed specimen of the animal presented to the Museum of the Pharmaceutical Society by Messrs. Peake, Allen, & Co.

BY MR. F. PEAKE.

The specimen before the meeting probably will serve to clear up many points relative to the quality and appearance of musk, and to explain the difference, and cause of there being so many varieties and qualities in the market.

The deer, as you perceive, is about the size of a greyhound, and, from the length of its tusks, it is no doubt five or six years of age, or perhaps more. Its brown stubby coat more resembles small porcupine quills than hair, and every part of the animal has a strong odour of musk. The head, legs, feet, and general outline, are those of the common deer; but in its habits it more resembles the hare, selecting a solitary place or form separate from its species. It is sometimes found in the lower ranges of the mountains, at an elevation of 7000 to 8000 feet. It is an inhabitant of the forest, but partial to woody ravines, and is common only on the spurs or projecting points jutting from the eternal snowy ranges, at an altitude of from 10,000 to 14,000 feet.

The natives take the musk deer by snaring, but this specimen was, it is believed, shot by the rifle. On being approached, they bound off with great rapidity, and when at about eighty to one hundred yards, turn round for a few seconds to gaze on their disturber with their faces towards him; at this instant the unerring aim is taken, but the prize is not always secured, as sometimes it falls down precipices where it cannot be reached. Days and days are frequently lost without falling in with any, and, on an average, upwards of thirty miles are traversed daily.

The toil of getting up and down these immense mountains is very great, and the pursuit is attended with many hardships and privations. The time expended

and distance traversed render the occupation very expensive, from the necessity of being accompanied by various grades of servants, some to hunt up and look out for game, others to carry provisions, cooking utensils, &c.; consequently, genuine musk must always maintain a high rate.

It will be seen that there is a thin membrane under the outer skin of the abdomen, of a small bladder-like appearance, containing a thickish soft substance, which is the musk. The musk in each membranous pod usually weighs from two drachms to an ounce; from an old deer, from one ounce and a half to two ounces; and its odour increases in proportion to the age of the animal. The male only furnishes the musk; at the age of twelve months and under it does not yield any, and it is only at three years that the pod contains sufficient to be worth the trouble of extracting. The practiced eye can generally judge if it be a young one—if so, it is allowed to escape. At two years the pod contains a yellowish milky substance, and, when first changed to musk, it yields not more than two drachms, frequently less.

A few extracts from our Himalayan correspondent's letters may more clearly illustrate its character:—

"One or two small parcels I have sent to London have had a preference in the market even to the best Assam. About sending it in pods with the hair on? I will do so if you like, but I would not recommend it, as my musk is genuine just as it is taken from the animal. The thin bladder-like skin dries in the sun in a few hours—that in the hairy pods, on the contrary, gets quite roasted in the process of preserving and preparing.

"The native plan is to make a stone nearly red hot, and the pod is first applied to it inwardly and outwardly till the skin is nearly dry, when it is stitched up, and the navel side is then held to the stone, pressing it and closing it with considerable force till the pod is quite dry. If this was not done, putrefaction would ensue, which, though only of the skin, would not improve the musk.

"I sent both kinds home, to ascertain which was best, and that in the pods without the hairy skin was declared to be far superior. All came from the same place, and from animals killed the same season."

In a letter of a former year he states:—

"I send you an account of the season's produce—viz. 120 pods, which weigh about 110 to 120 ounces or more, as they are large. The small ones being nearly all skin, I thought it advisable to let the natives have them to dress in their way and to sell to natives."

The musk pod familiar to us all is this membranous bladder, cut from the deer with a portion of the outer skin; it is pressed and stitched up, and dried on a hot stone. By this continued heat much of its odour is driven off, and it is consequently deprived of its qualities as a remedial agent, and for the use of the perfumer greatly deteriorated. A large quantity of musk collected by natives, which is invariably falsified, finds its way to this and other countries. They cut the young pods, containing no musk at all, as before mentioned, and fill them with the liver and blood of the animal, mixed with this yellow fluid and a small portion of genuine musk, fill, and sew them up in the skin, and dry on the hot stove; or those which yield half a drachm to a drachm they mix and dry in like manner.

At one of the Government sales in India of presents given by native princes, there were many pods of musk, to appearance very fine, which proved to be nearly worthless; they had evidently been "made up," and from long keeping the little real musk they contained had considerably evaporated.

It would be a difficult matter for a native to resist the temptation of not making some addition even to the finest pods, or of extracting a portion and filling it up with the mixture of blood and liver.

The interior of the Himalayas where the supply is obtained is towards Ladâk, Thibet, and Chinese Tartary, and, as these mountains extend over so many thousand miles, it is probable that the musks known as China, Nepaul, and other musks, and perhaps some Russian, are from the same districts. The Tartar tribes wander from place to place, bartering with the natives of these several countries who have access to these regions. Hence the musk would be from the same species, the difference in appearance being caused by its varying age and mode of preparing and drying.

The genuineness of musk depends on the honesty of the natives and others who procure and dispose of it to the various markets.

The musk in the membranous bladder yields nearly double the quantity of grain musk to an equal weight of musk with the skin and hair.

Albion Place, London Wall, December 27, 1860.

The CHAIRMAN proposed that a vote of thanks be passed by the meeting to Messrs. Peake and Allen for the very handsome present they had presented to the Museum of the Society, as well as for the paper just read, which was carried unanimously.

NEW FORM OF CONDENSER.

Mr. SQUIRE exhibited a glass condenser, to be used in the place of a Liebig's condenser. It consisted of a glass tube bent into the form of a helix and fixed in a cylinder like an ordinary worm-tub. It was made by Mr. S. Hayward, of 17, Hertford Street, Fitzroy Square.

ON ACCIDENTAL POISONINGS.

BY MR. JULIUS SCHWEITZER.

THE readers of the *Pharmaceutical Journal* are well aware that, in consequence of the numerous cases of poisoning which have arisen through accident or carelessness, propositions have been made from time to time to restrict the sale, and to ensure greater safety in the use of those drugs and chemicals which are generally called poisons. The frequency of these attempts shows how universally the importance of this matter is felt. The manifold ways, however, in which accidents occur, the necessity of daily dispensing every description of powerful drug, the different educational standing of all vendors and dispensers of medicines, and above all the wide and indistinct range of the so-called poisons themselves, are difficulties which have hitherto frustrated every effort to prevent these deplorable occurrences. It would seem, indeed, as if at last the conclusion prevailed that these accidents are entirely beyond human control, and must be left solely to Providence and individual responsibility.

It is, therefore, with considerable diffidence that I venture to bring this subject forward, with a view of proposing the adoption of certain precautions by which I believe those accidents arising from mistake or oversight may to a considerable extent be avoided. The principal questions to be solved, in providing a remedy, I take to be as follows:—

1. What is a poison?
2. Which cases of poisoning should we attempt to prevent?
3. Can we further ensure the safe and proper use of active medicines after they are entrusted into the hands of the public?
4. Can we improve and practically alter the present mode of keeping poisons?

Attempts at legislation on this subject have failed on account of the impracticability of the proposed means, and of the narrow and faulty conception of "What is a poison?" It is useless to compile lists of poisonous substances, which the daily

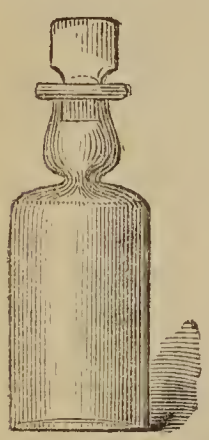
additions to the Materia Medica would in a short time render more or less defective. The small quantity or dose which produces an injurious or fatal result is the true characteristic of a poison. Articles of medicine all partake more or less of an active or poisonous character, which is definitely measured and expressed by their recognized dose. It would, therefore, be neither bold nor incorrect to designate, once for all, every article a poison which could only safely be applied for internal use to a certain very limited extent, or whose general dose did not exceed a certain small number of grains. The selection of this dose, the zero on the scale of poisonous medicines, naturally requires a certain amount of consideration; but supposing we say that every solid whose usual maximum dose does not exceed five grains, and every liquid the maximum dose of which does not exceed a drachm, shall be considered a poison, we shall be able at once to separate all articles which we hitherto know to possess poisonous properties. The advantage in adopting such a general mode of designating a poison, will at once become apparent. New alkaloids, or articles of materia medica are continually being brought into use; the first question to be decided with every new thing is its dose, and until that is satisfactorily fixed, no general use can be made of it, and every fresh interloper has, so to say, to wait until its character as to poisonous or harmless disposition is well ascertained.

The cases of poisoning to which I wish to direct special attention are those arising from purely accidental causes. Cases where laudanum is given instead of tincture of rhubarb or black draught, or in which a relative or nurse administers poisonous external applications instead of a mixture, or gives two tablespoonfuls of some active medicine instead of a teaspoonful. These are cases which deserve our most thoughtful consideration, and which it should be within our power to prevent. Educational qualification on the part of the dispenser is as essential and even more necessary than proper plans and proper places for the medicines with which he deals. But theoretical and practical proficiency, necessary as they are in the responsible occupation of a chemist, are but human perfections and liable to fail, and when by some simple contrivance we can force every poisonous ingredient to become its own watchful monitor of danger, without in the slightest degree occasioning any impediment in its use, we may fairly say that we are rendering safety doubly safe, and contributing to the prevention of many an oversight and mistake.

On referring to cases of accidental poisoning, we find, to our credit, that in the majority of instances the mistake occurred elsewhere than at the chemist's. Various as the causes of these accidents have been, however, I do not remember a single instance where pills or powders proved the means of any fatal occurrence. Trivial as such a fact may appear, it nevertheless deserves our serious attention. The difficulty of taking three or four opiate pills or powders equals by no means the nauseous taste of many an outward application, which before now has been taken by mistake and proved fatal. Taste, smell, consistence, and appearance of medicine are, in fact, of the greatest possible insignificance in the prevention of accidents. The safety attached to the administration of pills and powders lies in the impression which even the most casual observer of these articles obtains. It stands to reason that these pills or powders are not intended to be taken at once, but one by one as they appear, no matter whether they are placed in one vessel or not.

What external difference is there between mixtures, liniments, drops, or draughts? Are we in any way impressed that the one is intended for internal, the other for external use? that the contents of the one bottle are to be taken at once, or by the ounce, drachm, or by a few drops? There are proper directions on each bottle, it is true, but have these proved sufficient in the eventualities we speak of? There are other marks of distinction which are also commonly

observed; some of these bottles are large, others small, some blue, green, white, and stoppered, some are square, others round, some have their directions written on a yellow, green, or red paper, others have white, blue, mauve, or other fashionable colours in print. All these differences may have their certain meaning; but how is any one, excepting the initiated, to understand them? How far can colour, always subject to taste and fashion, either on glass or paper, be a sufficient safeguard or warning in the half-darkened sick-room? No wonder that drops and liniments have been given by mistake with frequently the most disastrous and regretted results. Mixtures, which are usually of a more harmless nature, are seldom the causes of serious accidents, and for them the ordinary bottle fulfils every requirement. They are taken by the ounce or half-ounce, and this quantity is discharged from the bottle without difficulty. But drops and external applications, frequently of a more powerful character, and used in much smaller quantities at a time, require something different and more in accordance with their intended use, than an ordinary bottle, which is neither appropriate nor safe. A common bottle, containing drops, has nothing to call our attention to the probably poisonous character of its contents, and the exceptional use for which they are intended; there is nothing to prevent the discharge by the ounce, the ready flow of a more than tenfold overdose; on the contrary, practice and skill are required to extract the proper and no-poisonous quantity. The bottle containing such active fluids should be so constructed as to discharge only a few drops at a time; the nurse or patient would then have his attention forcibly drawn to this dropwise discharge; he would be reminded that the bottle in hand could not possibly contain the mixture of which he has to take one or two tablespoonfuls—it would take him an unusual time to extract this quantity—the cause of this delay would be ascertained, the direction read, and the mistake discovered. The annexed cut represents a bottle which fulfils this condition. It is constructed with a considerable constriction in the lower part of the neck.



Bottle for drops.

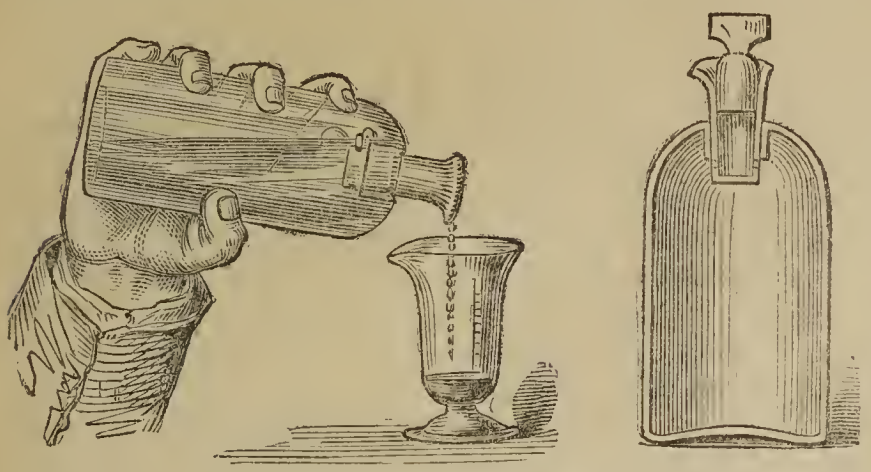
A peculiar rough exterior of all bottles containing externa applications would in like manner strike the sense of touch, when a pre-occupied mind would otherwise allow a mistake to pass unobserved. It is more difficult to deceive sight and touch, two senses, than sight alone. Still further caution may be observed when the lotion is of a very poisonous nature, by contracting the neck and diminishing the flow.

Bottle for containing external applications.

The rare occurrence of accident through error in dispensing, is proof of the habitual caution and vigilance exercised by the pharmaceutist, and undoubtedly redounds to his credit; it should not, however, render him reluctant to entertain any suggestion, which may lessen the probability of danger, by effecting a modification in his old arrangements. Most of the poisonous medicines are in too frequent use to admit of their being locked up or kept in secluded and out of the way places. The small quantities which are each time required, offers perhaps the only opportunity of obtaining greater control over their keeping and use.

The proposed new dispensing bottle is so constructed, as to emit with perfect ease and freedom the quantities which are usually required, and so far from causing any delay in the act of dispensing, may even be said to save time, as these small quantities can with the greatest nicety be regulated at once, and no pouring backwards and forwards, from measure to bottle, need ever occur. This bottle

may be washed, filled and emptied, as quickly as any ordinary bottle, by simply removing the well-fitted, twice perforated neck, which, when at rest or for ordinary use, will be an indispensable assistance, and at the same time prevent every possibility of its being mistaken for a bottle containing a more innocent tincture or fluid. The small stream flowing from this removable lip, tells you as effectually of its dangerous contents as the word poison pronounced by an invincible agency. These bottles discharge their contents by the drachm, and what is more natural than that they should contain those fluids whose ordinary recognized dose is not more than a drachm?



Dispensing bottle for liquids.

It is not necessary to look with the same anxiety on poisonous solids or powders. They do not prove such causes of danger. Their weighing takes a long time; they remain consequently longer under our eyes; their appearance offers more characteristic marks of distinction than the uniform shapeless fluids, and each in its turn appeals to our senses, and enables us to avoid mistake. Still even here we find many exceptional cases where a distinct arrangement may prove necessary and acceptable. The quantities of these poisonous solids which we require are exceedingly small indeed, and these powder bottles need therefore only discharge small quantities, without, however, preventing us from obtaining a large quantity when we desire it. By this, under ordinary circumstances, but small discharge, and by the different appearance of the whole bottle, a mistake with a more innocuous powder will be most effectually avoided, and the greatest safety obtained in the daily use of those solids whose ordinary dose is not more than five grains, and which individually we know under the name of poisons.

Dispensing bottle for powders.

The discussion which followed the reading of this paper was somewhat desultory, in consequence of the lateness of the hour. It was elicited that the bottles now recommended for use differed materially from those first introduced, and it was suggested by some of the speakers that further improvements may probably yet be made.

Mr. Waugh thought some advantage might attend the use of the small bottles for laudanum, but that the pharmaceutical body ought not hastily to adopt these bottles, unless they were satisfied that no better arrangement could be devised for securing the desired object. Until they all agreed together, and were prepared to carry out the same system, it was no use trying to introduce so extensive a change as was now proposed. He had great confidence in a clear label, with the exercise of all the senses by those required to read it, as the best safeguard, and feared that by inducing nurses and others to trust to the mere shape of a bottle, the danger would be increased. Considering the great amount of medicines taken, it was a standing miracle to him that so few accidents happened. The great danger complained of was a bugbear—a myth. Under any system

accidents would sometimes occur, and the only way to prevent them entirely, would be to induce people to give up taking physic altogether.

Dr. Squire said the question naturally arose in connexion with this subject, and this was not easily answered—What is a poison? Mr. Schweitzer had only shifted the difficulty from the word "poison" to "dose." There was no recognized maximum dose of anything, and, therefore, the difficulty still remained. It would be a matter of individual opinion with many substances whether they should be put into poison bottles or not. Coloured labels were, after all, the best protection, and he believed that to trust to the shape of a bottle to indicate a poison was to lean on a broken staff that could afford n support.

Mr. Haselden thought there could be no doubt as to the utility of the small bottles for laudanum, which, if used, would prevent the contents of the laudanum bottle from being substituted for a draught.

Mr. Hills thought it very desirable they should find out the best arrangements to adopt with reference to poisons, and that they should all agree to adopt them, but he was not yet convinced that the proposed bottles were the best that could be devised; indeed, it appeared that the original form had already been greatly improved upon, and perhaps it admitted of further improvement. All were agreed that education and caution, together with a good bold clear label, formed the best safeguards; but if, in addition, a form of bottle could be devised which would add to the safety of the public and the pharmaceutist, it should be adopted simultaneously by the body at large. He was sorry the subject of these poison bottles was not brought to a meeting of the Pharmaceutical Society in the first instance, instead of being published in the medical journals.

Mr. Squire suggested that even with reference to the supposed advantage of using the small bottles for sending out laudanum, there would be no security that it should be always kept in such bottles. If the poison bottle should be broken and the laudanum transferred to an ordinary bottle, the danger would be greater than if no poison bottle had been used, in consequence of the impression previously produced that all medicines in common bottles were not poisonous.

LIVERPOOL CHEMISTS' ASSOCIATION.

The Fifth General Meeting was held at the Royal Institution on the evening of Dec. 6th, 1860,

THE PRESIDENT, DR. EDWARDS, IN THE CHAIR.

Mr. George Stephens, Mr. J. L. Jones, and Mr. J. S. Tyerman were elected Members of the Association.

The Secretary announced donations to the Library, of the *Pharmaceutical Journal*, from the Pharmaceutical Society; and the *Transactions of the Historic Society of Lancashire and Cheshire*, vol. xii., from the Society. To the Museum, of a Wasp's Nest fixed to the branch of a tree, from Mr. T. Trevitt; specimens of the Myrtle Wax Tree, Sea Island Cotton, Wild Rice, and an unknown Cereal Plant, all from Georgia, U.S., were exhibited by Mr. J. S. Tyerman.

The Secretary (Mr. T. D. Walker) read a paper "On the Soap-Nuts recently presented to the Museum," in which he described the different vegetable substances which had been, or were at the present time, used as substitutes for soap, referring more particularly to the specimens of soap-nuts or berries in the Museum. One of these, from the West Indies, is the dried fruit of the *Sapindus Saponaria*. It presents very much the appearance and is about the size of a dried cherry, without smell, at first of a sweetish, and afterwards persistent bitter taste. The pulp lathers with water, and may be used instead of soap. The other specimen is the produce of the *Sapindus emarginatus*, from India. It possesses similar properties to the fruit of the *S. Saponaria*, but is much larger and of a peculiar very disagreeable smell. In this specimen the seed had been carefully removed from each fruit, most probably for use as beads, necklaces, rosaries, &c. At one time they were largely imported into this country for making buttons. Mr. Walker briefly suggested

several economic purposes for which the peculiar saponaceous properties of these berries rendered them available, such as the woollen manufacture, bleaching, dyeing, calico-printing, &c. &c.

Mr. H. S. Evans then read a paper "On the Pharmaceutical History of Senna," describing the botanical and other characteristics of the various kinds of senna. The cultivation of the plants, collection of the leaves, and the adulterations to which they were subject, &c., were brought under notice. He also described the appearances presented under the microscope by true senna and its adulterants.

A vote of thanks to Messrs. Walker and Evans for their papers, and to the donors to the Library and Museum, terminated the proceedings.

CONVERSAZIONE, *Dec.* 20, 1860.

The Association has for some years been in the habit of receiving its Members and friends at a Scientific Conversazione, to which ladies are admitted. The last was held on the evening of Dec. 20th, 1860, at the Royal Institution, and was as successful and brilliant a reunion as any of its predecessors.

The rooms were crowded with a fashionable company, between 300 and 400 persons being present. Every department of the noble institution—the superb museum of natural history, conchology, fossils, &c., the valuable collection of curiosities from foreign climes, and the geological gallery—was thrown open for the occasion. The gallery of art, also, was opened for promenade, and here were exhibited the paintings and drawings of the pupils of the Royal Institution School; most creditable productions, generally speaking, whilst some of them evince talent of no mean order. With the view of rendering the reunion as attractive and interesting as possible, several of the members and friends of the association furnished a variety of articles for the amusement of the company, consisting of scientific instruments, works of art, &c. Amongst these may be mentioned a collection of splendid stereoscopes of varied construction, galvanic and optical apparatus. Some elegant bronze statuettes, and a "magic clock," with transparent dial mounted on a small pedestal, there being no perceptible communication between the hands and the works. A beautiful collection of photographs, including a large group of the officers of the Lancashire Militia. Fine specimens of mounted seaweed. An electric clock. A Chinese production in the shape of a statue of elaborate workmanship, adorned with the richest colouring, representing a deity worshipped by that nation, taken from the "Temple of Ten Thousand Gods" at Pekin, together with a collection of useful and ornamental articles of Chinese manufacture.

In the geological gallery, a large variety of objects were exhibited under the microscope, about twelve gentlemen having lent their microscopes, and volunteered their own services for the occasion.

About two hours having been devoted to inspecting the various objects of interest, an agreeable promenade, and refreshments, the company adjourned to the lecture-hall, when the chair was taken by Dr. Edwards, the president of the association, who delivered some explanatory observations on spectrum analysis, polarized light, magnetic and electric light, illustrated by interesting and instructive experiments, comprising projections by the oxycalcium lantern and polariscope, and by electrical discharges through gaseous media and in vacuo, &c. The address of the chairman afforded a great amount of information upon the subject in question. In the course of his remarks he referred to Messrs. Kirchkoff and Bunsen's spectra meter, for the chemical analysis of substances. This instrument was exhibited and explained by Mr. I. B. Cooke. The president exhibited one of Professor Way's new electric lamps, a very compact and comparatively inexpensive article, adapted for lighthouse purposes. At the top of the lamp is a reservoir of mercury which flows through the illuminating portion in a continuous fine stream into a receptacle beneath. A wire from a battery is applied to the mercury as it flows from the reservoir, and an exceedingly bright light, of a peculiar colour, is emitted. Experiments were made with the lamp, showing that it was well adapted for any purpose where strong and brilliant light was required.

The experimental illustrations of the various subjects brought before the audience by Dr. Edwards were of an extremely brilliant and striking character, and elicited frequent bursts of applause.

At the conclusion of the proceedings a vote of thanks to Dr. Edwards was moved by Lieut.-Col. Wm. Brown, who expressed his high appreciation of the evening's entertainment, and having been seconded by Dr. MacGowan (of New York), late Medical Missionary to Japan, was carried with applause. The President having appropriately responded, the company broke up shortly before eleven o'clock.

SIXTH GENERAL MEETING, *January* 3, 1860.

THE PRESIDENT IN THE CHAIR.

The following gentlemen were admitted Members of the Association:—Mr. T. B. Dawber, Mr. Jas. Ansdell, Mr. Patrick Pugh, Mr. J. J. Rose, Mr. Martin Murphy, Mr. J. Matthews.

The SECRETARY announced the following donations:—To the Library—A vol. of *Proceedings of the American Pharmaceutical Association;* and *The Chemist and Druggist*, for December, 1860, from the Editor of the latter; the *Pharmaceutical Journal*, for January, 1861, from the Pharmaceutical Society. To the Museum—A box of remarkably fine specimens of Tragacanth, from S. H. Maltass, Esq., Smyrna. Mr. Tyerman, Curator of the Botanic Gardens, sent for exhibition some interesting objects; and Mr. Mercer had on the table a collection of Distillatory Apparatus, Hydrometers, and other requisites for Testing Wines, of a very ingenious and useful character.

The SECRETARY read a letter from the Secretary of the Royal Institution, conveying a resolution of the committee, that at the request of the chairman of any meeting held in the building, the Curator of the Institution have power to lend specimens, &c., from the various Museums, for the purpose of illustrating lectures or papers given at such meetings.

The SECRETARY also read a letter he had received from Mr. William Longshaw, of Boston, U.S., a gentleman who had been engaged in an Arctic expedition from America, and on his return had passed through Liverpool, and called upon several Members of the Council of the Association. During his short stay, he paid a visit to the Museum, with which he was greatly interested, and promised to exert himself in procuring donations for it from friends in America. Mr. Longshaw stated in his letter, that he and some other friends in Boston had sent a donation of four vols. of the *Proceedings of the American Pharmaceutical Association;* that he had received from Messrs. Wilson, Thayer, and Tilden, promises of donations to the Museum, numbering above 400 specimens; and that he would continue to use his influence in the same direction.

The CHAIRMAN drew attention to the fact of three valuable horses belonging to a commercial firm in the town, having been poisoned by drinking water holding arsenious acid in solution. The cask from which the water was taken had been sent amongst others, in the ordinary course of trade, as empty returns, and had been used for containing a supply of water, in consequence of the pipe being frozen up, no suspicion being entertained that they contained any deleterious matter. On the horses being taken ill soon after drinking the water, an examination was made, and the cask was found to be coated with arsenious acid, having been apparently used for containing sheep-wash, or some other liquid containing arsenic in solution. Several members expressed their opinion of the gross carelessness of the parties returning the cask, without any intimation of the use to which it had been put.

Mr. NATHAN MERCER then delivered a lecture "On the Commercial Estimation of Alcohol in Wines." Mr. Mercer made some remarks upon the alteration in the duty on the French wines, which came into force on the 1st inst., and the dissatisfaction excited by it in the trade, in consequence of low-priced wines having to pay the high rate of duty. He then explained the various methods in use for ascertaining the quantity of alcohol in spirits, wines, &c., and exhibited the apparatus employed at the Custom House for this purpose; he also described another on a similar principle but improved construction, the invention of Mr. Weir and himself. This was put into operation, and the alcohol contained in a sample of wine was ascertained by distillation, and testing with the hydrometer in the usual manner.

A vote of thanks to Mr. Mercer, and to the donors to the Library and Museum, closed the proceedings.

SEVENTH GENERAL MEETING, *January 17th*, 1861.

MR. J. ABRAHAM IN THE CHAIR.

The SECRETARY announced the following donations:—To the Library—Four vols. of *The Proceedings of the American Pharmaceutical Association*, from Messrs. W. Longshaw (1), T. Carney (1), and S. McCotcard, of Boston, U.S.; also a copy of *The Act of Incorporation and Laws of the Massachusetts College of Pharmacy*, from Mr. W. Longshaw. To the Museum—Eight large and beautiful photographs of eminent Chemists and Pharmaceutists, from Messrs. Maull and Polyblank, London.

Mr. GEO. STEPHENS delivered a lecture "On Silk—Silk Dyeing and Printing," illustrated by specimens of silk in the various stages of manufacture, materials used in dyeing, and the metallic blocks used in printing, &c.

At the close of the lecture, some discussion took place on the subject of the new dyes now so extensively used, and on other points mentioned by the lecturer, after which a vote of thanks was passed to Mr. Stephens and the various donors, and the meeting separated.

ORIGINAL AND EXTRACTED ARTICLES.

NOTE ON *ANACAHUITE WOOD*, A REPUTED REMEDY FOR CONSUMPTION.

BY DANIEL HANBURY, F.L.S.

DURING the past autumn there have been several inquiries, chiefly on the part of merchants connected with Germany, for a new drug imported from Mexico under the name of *Anacahuite Wood*. A single package of this drug was offered for sale in September last by a London drug broker, and purchased for shipment to the Continent. In Germany the demand has been very considerable, and although 10,000 pounds of the wood have been imported into Bremen and Hamburg, and sold at a high rate, the requirements of purchasers are still far from being satisfied.

In order to explain the circumstances that have led to the introduction of this new drug and the valuable properties which it is asserted to possess, I will here give the translation of a short paragraph extracted from a popular German journal into the pages of the *Archiv der Pharmacie* for November last.

> There grows at Tampico in Mexico a tree with the wood of which called *Anacahuite*, the Indians cure all chest complaints, especially diseases of the lungs. The inhabitants of Tampico have also used this remedy, and have succeeded in completely curing consumption with it, even in the case of persons in whose families the disease appeared to be hereditary. The Prussian Consul at Tampico has for years past observed the beneficial effects of this wood, and, as in all cases the patients were cured by the use of it, he has been induced to communicate the subject to the Prussian Government, and to send a considerable quantity of the wood to Berlin, where experiments are now being made in the hospitals to determine its medicinal efficacy.
>
> Anacahuite wood is administered in the simple form of infusion, shavings of the wood, previously deprived of its bark, being treated with boiling water, as in the preparation of tea. This infusion is drunk in the morning fasting and again in the evening at bed time. In cases where the disease has already made considerable progress, the infusion may be used as often as the patient is inclined to drink. Highly seasoned food and strong alcoholic beverages as well as coffee, must be avoided while the medicine is being used. Spitting of blood is removed in a few days ; in all cases, however, it is advisable to continue the use of the medicine for some time even after recovery.

Anacahuite wood, it will thus be seen, is a production of Tampico, whence, in fact, all the supplies that have reached Europe have been shipped. Its botanical origin is at present unknown. Dr. Otto Berg, who has elaborately

described its external characters and anatomical structure,* thinks that from the organization of the bark and wood it is probably derived from some papilionaceous tree, although there are only general appearances that guide him to such an opinion. It is to be hoped, however, that this question may be soon set at rest by good, dried specimens of the flower, fruit, and leaf of the tree being obtained from Tampico, and submitted to some competent botanical authority in Europe.†

Anacahuite wood, as I have seen it, consists of truncheons of about two feet long, varying from the thickness of a finger to that of a man's arm. The wood is covered with a thick, fibrous, greyish-brown bark, coarsely furrowed longitudinally with deep cracks, and so tough that it may be stripped off in pieces of considerable length. A white, pulverulent matter, resembling an efflorescence, occurs between the layers of liber from which it escapes as dust when the bark is torn. When one examines a transverse section of a truncheon, one perceives the bark to be of considerable thickness and to consist of two more or less defined zones—the inner more compact. The wood is of a pale brown, marked with concentric zones, which, however, are too little distinguished from one another to be counted with any certainty. The pith is frequently eccentric; its transverse section sometimes shows a stellate form.

Anacahuite wood is inodorous and insipid. A strong decoction is transparent and of a sherry brown colour; it is blackened by a persalt of iron, but neither a solution of gelatine nor of iodine affects it. The taste of the decoction is extremely slight and unremarkable, so that one may reasonably be permitted to doubt the extravagant, though, if true, very gratifying assertions regarding the virtues of the drug. The experiments, indeed, that have been instituted in the Great Hospital at Berlin, have hitherto had, as I am informed by Dr. C. G. Mitscherlich, no satisfactory results. The details of the cases have not, however, yet been published.

SPERMACETI OINTMENT AND OLIVE OIL.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—I am glad to see Mr. Barnes' paper on spermaceti ointment, which must, one might suppose, silence for ever such arguments as those by which all manner of deviations from the P.L. were justified and explained away when the subject was previously introduced. (*Vide Ph. Journ.*, vol. xviii., pp. 259-356, et seq.)

Mr. Barnes has taken the trouble to prove by specimens prepared by himself, that the substitution of bleached oil deteriorates the ointment. I had contented myself by proving the truth of the allegation in which the discussion originated—that the commonly practised deviations from the Pharmacopœia resulted in deterioration—by means of specimens impartially collected from other sources, and I now repeat what these specimens amply evidenced, however much the Society may have thought fit to ignore it—that by far the most general sophistication is Lard.

But a fallacy appears still to haunt the spermaceti ointment question, which

* *Bonplandia*, 15th Oct., 1860, p. 302.

† I have not been able to find any notice of Anacahuite Wood in any author treating on Mexican Materia Medica whose works I possess. Hernandez (*Rerum Medicarum Novæ Hispaniæ Thesaurus*, Romæ, 1651, p. 67,) mentions a tree called *Morbi Gallici arbor*, whose Mexican name *Nanahuaquahuitl* is, perhaps, not an impossible version of our *Anacahuite*. Heller (*Reisen in Mexiko*, Leipzig, 1853, Anhang. sect. 3,) does not enumerate *Anacahuite* among the useful plants of Mexico; nor do I find it in the Catalogue of Mexican products (including a long list of woods) sent to the Paris Exhibition of 1855; or in the papers of Schlechtendal on Mexican Drugs, contributed to the pages of the *Botanische Zeitung*.

lies at the bottom of the whole difficulty, and oddly enough those who have helped to manufacture the spectre are most appalled by its terrors. It is taken for granted that the public prefer a white ointment, and it has even been implied that the Pharmaceutical body, whatever their convictions may be, must accommodate themselves to the prejudice of "*Every old woman who is of a different opinion.*" I distinctly deny that this preference exists in any form which we are called upon to propitiate. It is my conviction and my experience that when you have overcome the public *prepossession* (which is quite another thing from *preference*) and have induced them to *try* the P.L. ointment, they infinitely prefer it to any other. But of course we know what it is to shock an old belief. The public have long been taught that white is the proper colour of spermaceti ointment, and they object to the yellow, not because they dislike it, but because they think it is wrong. It is ridiculous for us who sedulously adopt this colour in the pomatums which we desire to render attractive to every sense, to say that the public dislike the yellow appearance, although it may be quite true that they *suspect* it. No doubt every one who particularly prides himself upon making an emulsive Mistura Ferri Composita, has sometimes found his preparation suspected, because it has a less bright green appearance than when made with desiccated myrrh; but does he therefore conclude that the public prefer the latter condition, and that it is incumbent upon him to adopt an inferior process in order to produce it?

If there was any defect in the P.L. formula, it would afford a more laudable motive for deviation than the trivial plea of improving the colour; but I am persuaded that those who have adhered to the simple sense of the P.L. instructions, eschewing all such improvements (?) as bleached oil, almond oil, or lard, and who consequently have a fair experience of the real thing, will agree with Mr. Barnes that there is very little to be desired. I quite agree with him that unbleached wax is a fitting corollary to unbleached oil, and was led by analogy to substitute it in the preparation of some spermaceti ointment for a very particular purpose; and it is gratifying to me to find that Mr. Barnes's experiments so fully confirm the conclusions at which I had independently arrived. But I should greatly regret any such changes as the omission of the spermaceti suggested by Mr. Squire, or the substitution, even permissive, of bleached oil, almond oil, or lard.

Mr. Allchin faces existing facts honestly, when he associates the white ointments commonly met with, with the use of lard, and he certainly has the homœopathic theory of "*similia similibus*" on his side, when he argues that animal fat must be the best application for animal tissues; but I am convinced that if he gave the two a good comparative trial, he would find that practically the (yellow) olive oil ointment was more penetrating, more emollient, more soothing, more cleanly, and in every respect more agreeable.

In conclusion, Sir, I hope that the spermaceti ointment controversy has done some good, and although the discussion at the Society's house in 1858 was eminently unsatisfactory to those who knew and deplored the substitutions which have been common in this simple preparation, yet the letters which followed were of a more encouraging character; and although it must continue to be a matter of regret that none of our distinguished leaders have unequivocally deprecated practices by which they cannot doubt that a useful ointment has been much disguised, often shamefully degraded (lard again), yet we may hope that the conclusive experiments of Mr. Barnes, and the modified opinions which Dr. Redwood has acknowledged, will remove the last shadow of excuse from the most general falsification to which any pharmaceutical preparation was ever subject.

I am, &c.,

Clifton, January, 1861. RICHARD W. GILES.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—With considerable interest I have just read Mr. Barnes's article in this month's Journal on Olive Oil and Spermaceti Ointment, together with the remarks made at the meeting; but there is one point in the subject which appears to have been overlooked—that is, the influence of the yellow colour of ordinary olive oil in preventing, or retarding, the action of the oxidizing ray when the oil is exposed to the light. This, I think, rather than anything in the odour of the oil, tends to preserve it from becoming rancid, and the experiments of Mr. Barnes with yellow wax ointment seems to confirm this view. That olive oil does become bleached, however, by continued exposure to light, I have repeatedly experienced to be true.

While I hold some of the gentlemen who, at the meeting, advocated the use of almond oil in high esteem, I cannot agree with them on that point, as I have found almond oil much more prone than olive oil to become rancid, and chiefly, I believe, because its pale colour allows of more chemical action by light.

The same ground of objection might be urged against a white ointment, which the growing intelligence of the public will not require when the effect of colour is explained; at least, I find it so with my customers, to whom I have sold an ointment made with unbleached Lucca oil for the past seven years. Some of them at first expressed surprise at not receiving the old white (lard) ointment, but have afterwards not only been satisfied with, but expressed a preference for, my ointment.

I am, &c.,

66, *Woodhouse Lane, Leeds.* Edward Brown.

In a letter relating to the same subject, Mr. Pollard, of Nailsea, suggests that in the forthcoming Pharmacopœia it should be indicated that unbleached olive oil should be used; and he also suggests the substitution of spermaceti ointment for lard in some of the officinal ointments, stating that he has found zinc ointment to keep much better when so made.

AQUA LAURO CERASI.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—In the last number of the Journal appears an article on this subject from Mr. Draper. Whilst agreeing with the writer in his objections to the present mode of preparation, which cannot be too strongly stated, I think his formula for an artificial preparation may be a good deal amended.

If an artificial preparation is to take the place of a natural product, the first essential of that preparation is, that it represents the former in strength and properties. If this be not the case, then one cannot be substituted for the other in all cases, and the pharmacien has to encumber his shelves with both, producing a little more confusion and a few more mistakes.

Some of the German Pharmacopœias have fixed the strength of Aq. Lauro Cerasi at half a grain of anhydrous hydrocyanic acid in f℥j. Here we have a definite quantity of the active principle given, and if we take a diluted hydrocyanic acid of five per cent., and add it in proper proportion to distilled water, and a few drops of Oleum Amygdalæ Essent., we shall have a preparation of definite strength in something like decimal proportions, and truly representing the real article, that may be sold for it whenever required. The following formula may be adopted:—

Acid. Hydrocyanic., five per cent., gr. 100
Ol. Amygdal. Essent., gtt. v.
Aq. Distillat., f℥x. ℿ

Some critics may reply that Oleum Amygdalæ Amaræ is not Oleum Lauro Cerasi, but I believe it to be the same thing, and Aq. Amygdal. Amar. and Aq. Lauro Cerasi are used on the continent as therapeutically the same. But to take a practical view of the matter—how many chemists would be found to have Ol. Lauro Cerasi in stock fit for use, when Aq. Lauro Cerasi was required?

I am, Sir, yours respectfully,

F. M. Rimmington.

FACTS AND FALLACIES CONNECTED WITH THE RESEARCH FOR ARSENIC AND ANTIMONY; WITH SUGGESTIONS FOR A METHOD OF SEPARATING THESE POISONS FROM ORGANIC MATTER.

BY ALFRED S. TAYLOR, M.D., F.R.S.

(*Continued from page* 377.)

DISTILLATION PROCESS FOR ARSENIC.

The plan which, after many experiments, I feel justified in recommending for the separation and detection of arsenic in liquids and solids, whether organic or inorganic, is based, 1st, on the ready conversion of arsenic into *chloride;* 2nd, the transformation of this compound to *hydride* by Marsh's process; 3rd, the production of metallic arsenic, of arsenious and arsenic acids from the hydride; and 4th, testing the products. When once obtained in the state of chloride, the presence of arsenic admits of easy verification, either by resorting to the process of Reinsch or that of Marsh. The quantity of arsenic present may also be determined either in this or a subsequent stage.

First stage—*conversion to Chloride.*—If the substance to be examined for arsenic is *solid*, it should be reduced to a fine powder, or cut into small pieces. In the analysis of the liver, spleen, or other soft organs, it will be proper to cut these into small portions, and to dry them either by a current of air or by the aid of a water-bath, so as to deprive them as much as possible of water. The complete elimination of the arsenic depends greatly on the perfect desiccation of the substance and the concentration of the acid, as the following experiments will show:—

One grain of white arsenic was mixed with two drachms of pure hydrochloric acid, in which it was readily dissolved, and the solution was distilled to dryness. The acid liquid in the receiver measured three drachms, one drachm of water having been placed in it for the purpose of condensing the acid vapours. Arsenic was abundantly detected in the distillate by all the usual processes. The washings of the retort (for there was no apparent residue) gave a mere trace of arsenic, calculated not to exceed the 1-4000th part of a grain. When a similar quantity of arsenic was boiled with the diluted acid (1 to 8), it was not dissolved; and when distilled, the greater part was left in the retort. When the experiments were repeated in porcelain capsules, there was no residue from the strong acid, but an abundant residue from the diluted acid.

Nearly all the soft organs, including the muscles, contain from 60 to 70 per cent. of water; and this furnishes a great obstacle to the entire separation of the arsenic by distillation. In the analysis of liquids, such as the blood, urine or vomited matters, it is desirable to bring them to dryness by a water-bath before treating them with hydrochloric acid.

The substance, whatever may be its nature, having been brought to perfect dryness, is covered with concentrated hydrochloric acid, the purity of which has been previously tested by operating on an equal quantity, according to a method to be presently explained. The quantity of pure hydrochloric acid used, must depend on the quantity of material for analysis. It should be sufficient to break up, dissolve, or mix freely with the whole of the solid. The

mixture should be made in a retort or flask fitted with a condensing tube, and then gradually heated by a sand-bath, until the acid liquid begins to pass over. The retort or flask may be connected with a receiver closely fitting to it, and holding a small quantity of distilled water. The water in the receiver should be just sufficient to condense and fix the acid vapours. The receiver, as well as condensing-tube, should be kept cool by wetting its surface with cold water or otherwise. The perfect condensation of the distilled liquid is ensured by this arrangement.*

The distillation may be carried to dryness on a sand-bath, or nearly so ; and it may be sometimes advisable, in order to ensure the distillation of the whole of the arsenic as chloride, to add to the residue in the retort another portion of pure and concentrated hydrochloric acid, and again distil to dryness. I have, however, found that portions of dried liver and stomach give up every trace of arsenic by one distillation, when a sufficient quantity of hydrochloric acid has been used in the first instance, and the distillation has been slowly conducted by a regulated sand-bath heat.

Second stage—*conversion of Chloride to Hydride.*—The liquid in the receiver is a solution of chloride of arsenic in water, or, as some believe, a mixture of hydrochloric and arsenious acids. It is in general colourless, when care has been taken; or if slightly coloured yellow, this will not interfere with the subsequent steps of the analysis. It contains no amount of organic matter which can lead to frothing in Marsh's tube, or to any deceptive results from the combustion of the gas produced. There is no loss by volatility at ordinary temperatures, since the water retains the chloride of arsenic ; but at the same time it is proper either to proceed immediately with the examination of it, or to place it in a stoppered bottle to prevent loss by evaporation of the distillate. The arsenical liquid in this state may be preserved for examination at any future period.

If a quantitative analysis is required in this stage from a given weight of the organic solid or liquid, one-third of this distilled liquid may be reserved for the purpose. Of the remaining two-thirds, a small portion may be diluted with four or five parts of distilled water and boiled. When boiling, a piece of bright copper foil (free from arsenic) should be introduced. If there is chloride of arsenic in the liquid, even up to the 1-4000th of a grain, its presence will be indicated by a change of colour, and by the deposit of a dark metallic film on the copper. If the liquid should be too much diluted for this purpose, it may be concentrated on the polished copper, and the deposit will after a time be apparent. If the quantity of arsenic present is believed to be very small, the surface of copper introduced should be proportionably small.

The larger portion of the distilled liquid should now be introduced into a bottle or flask, the capacity of which must be regulated by the quantity of acid liquid to be examined. To the neck of this flask there should be fitted, by means of a soft cork, a hard glass tube of about a quarter of an inch in the bore. After rising an inch or two, it should be bent at a right angle, and carried horizontally for the length of a foot. It should then be bent at another right angle, for the convenience of dipping into liquids contained in glasses or tubes.

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* As a substitute for a retort when the quantity of matter for distillation is not large, I have found a most convenient form of apparatus to be a globular flask of thin glass, with a short neck. Into this is fitted a tube of hard glass, from two to three feet in length, and one quarter of an inch in the bore. It should just pass through the cork in the neck of the flask, and this end of the tube should be bevelled off obliquely to a point, in order to prevent any of the liquid in the flask from being carried over. The tube should be covered spirally with layers of blotting-paper (kept constantly wetted), for at least two feet of its length, and should terminate in a Florence flask, to which it is fitted by a cork. This flask should be kept cool by immersion in a basin of water, or by covering its surface with wet tow.

The horizontal portion of the tube should be drawn out in three different places, until the diameter of the tube does not exceed the tenth of an inch. This allows of the collection of metallic deposits in a concentrated form, and on surfaces in which they may be easily examined and tested. This arrangement was, it appears, first proposed and employed by M. Lassaigne, in 1842.* Care should be taken to employ glass free from lead. The tube should resist a red heat without blackening.

A piece of pure zinc is now dropped into the bottle containing the distillate. If the action of the acid is too violent, a little water may be added, and the cork then fitted. Two test glasses or tubes, the one containing about a drachm of moderately strong solution of nitrate of silver, the other about the same quantity of the strongest nitric acid containing nitrous acid (sp. gr. 1.522), should be at hand to receive the gas from the bent tube as it escapes.

The solution of *nitrate of silver* furnishes an excellent medium for detecting minute traces of arsenic. So soon as the air from the flask is removed, and the hydride of arsenic passes over, the solution of silver is blackened. This blackening is owing to the production of metallic silver, which is precipitated with a trace of arsenic. The arsenic takes the oxygen of the silver salt and passes to the state of *arsenious acid*—the nitric acid being set free in the liquid. The solution of silver may not show any blackening or darkening from the passage of the gas even after half an hour. Under these circumstances, no arsenic is present. We have in this method, therefore, the means for detecting any arsenical impurity in the hydrochloric and sulphuric acid or zinc that we employ; and before using these in any analysis, it would be desirable thus to test them by this process. Unless we obtain negative results by passing the hydrogen produced into nitrate of silver, we cannot safely employ them.†

Third stage—*production of arsenic and its oxygen compounds.*—The silver solution completely arrests the gas and oxidizes the arsenic. When the current has passed through it for some time, a strong heat may be applied to the horizontal portion of the conducting-tube about one quarter of an inch before each contracted space, beginning with that which is nearest to the flask evolving the gas. The hydride is decomposed at a full red heat, and metallic arsenic is deposited in a dark ring or crust on the interior of the glass, at a short distance from the spot which is heated. The appearance of this will be brown, black, or strongly metallic, according to the quantity of arsenic present, and the time during which the heat is continued. Under these circumstances, hydrogen only escapes; but as the end of the tube is still immersed in the solution of nitrate of silver, no arsenic is lost. The operator may, at his pleasure, thus procure three separate metallic deposits on the three contracted portions of the horizontal tube. Having prepared another right-angled tube with a cork to fit the flask, this should be rapidly substituted for that in which the deposits are collected. More zinc may be added to the flask, if necessary, and the gas evolved should be allowed to exhaust itself in strong *nitric acid.* Not a trace of gas escapes through this strong acid:—the whole of the arsenic is arrested and converted to arsenic acid, which may be obtained by evaporating the nitric acid on a sand-bath.

Fourth stage—*testing the product.*—By the methods suggested, the hydride furnishes, 1st, as a result of decomposition by heat, a deposit or mirror of

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* "Manuel Pratique de l'Appareil de Marsh," par Chevallier, 1843, p. 19.

† It not unfrequently happens, even in testing pure zinc, as well as pure acids (hydrochloric and sulphuric), by this method, that although, after a quarter of an hour, the solution of silver may show no darkening, a black ring will be formed on the inside of the extremity of the tube which dips into the solution. This is precipitated silver, probably caused by the presence of minute traces of arsenic or phosphorus.

metallic arsenic; 2nd, as a result of the action of nitrate of silver, *arsenious acid;* 3rd, as a result of the action of nitric acid, *arsenic acid.*

1st. The conducting-tube should be divided into as many parts as there are metallic deposits. The contracted portion of the tube being sealed, the metallic deposit may be gently heated, and if it be due to arsenic a ring of octahedral crystals of arsenious acid, small but well defined under the microscope, will be procured. If there are several metallic deposits, these may be broken up and heated in a wider tube. By this means sufficient arsenious acid may be procured to yield a solution of arsenic, which will give the usual yellow and green-coloured precipitates with the ammonio-nitrate of silver and the ammonio-sulphate of copper. There is, however, ample corroboration in the subsequent stages, without resorting to the liquid tests. 2nd. *Arsenious acid* is obtained in solution by filtering the decomposed nitrate of silver into which the gas has been passed, and by precipitating the filtered liquid with a slight excess of pure hydrochloric acid, so as effectually to remove the undecomposed silver as chloride. When the precipitated chloride has completely subsided, the liquid may be again filtered until it is perfectly clear and free from any silver salt. In this state a current of washed sulphuretted hydrogen gas should be passed into it, when the well-known yellow sulphide of arsenic will be precipitated in greater or less quantity, according to the quantity of arsenic present. Independently of the colour of the precipitate, which distinguishes sulphide of arsenic from all metals excepting cadmium, it will be found that it is dissolved by ammonia, and not dissolved by hydrochloric acid in the cold.* 3rd. *Arsenic acid* is a product of the action of strong nitric acid on the hydride. It may be procured by evaporating to dryness on a sand-bath, in a small porcelain capsule, the nitric acid after it has been saturated by the current of arseniuretted hydrogen gas passed through it. When quite *dry*, it appears as a white residue, if the nitric acid was pure. It is fixed at the ordinary heat of a sand-bath, and, after exposure to air for a short time, it will become moist and deliquescent. It should be completely dried before any test is added to it, because the presence of traces of nitric acid may interfere with the action of the test. If not in a deliquescent state as the result of exposure, a small quantity of distilled water should be added, to detach the acid from the capsule. One or two drops of a strong solution of nitrate of silver should now be added, and, if the residue is arsenic acid, a brick-red precipitate of arseniate of silver will make itself visible. In place of the nitrate, a strong solution of ammonio-nitrate of silver may be employed, provided the ammonia is not in excess. This has the advantage of neutralizing the solvent effect of any nitric acid which may be adhering to the solid arsenic acid, and it reveals the presence of small quantities better than the nitrate.

With these combined results, it is conclusively proved that arsenic must have been present in the substance analyzed. We have here, in the production of metallic arsenic, and of its two acid compounds with oxygen, as well as in the conversion of these to sulphide of arsenic and arseniate of silver, the maximum of evidence which an analyst could desire. Beyond this it appears superfluous to carry the chemical proof. The combustion of the gas, as suggested by Marsh, with the collection of deposits from the flame, while it necessarily entails much loss, is not required in any stage. The decomposition of the hydride by a red heat in a close tube answers all the purposes of combustion, without the risk of loss from the frequent opening of a stop-cock. A larger quantity of metallic arsenic can be thus obtained in one operation; and any gas which

* The sulphide of cadmium is affected in a contrary manner by these reagents. It is insoluble in ammonia, but soluble in hydrochloric acid. Cadmium could not be present: it cannot be distilled as chloride, and it does not combine with hydrogen to form a hydride.

escapes decomposition, is arrested and decomposed by the nitrate of silver or nitric acid.

The quantity of arsenic present in the distillate may be so small as only slightly to darken a solution of nitrate of silver, and to yield a hair-brown film of metallic arsenic by heating the tube. In cases in which the quantity of arsenic is very small, it will be convenient to extemporize a Marsh's apparatus, by fitting to a test-tube a cork traversed by a funnel-tube and a short exit-piece bent at right angles. This should be connected with a piece of tubing containing broken chloride of calcium, so that the gas as it passes may be dried. A tube, drawn out for about two-thirds of its length to almost a capillary bore, should be fitted by a cork to the other end of the chloride of calcium tube. Zinc is placed in the apparatus, the funnel-tube is then fitted, and the distillate, suspected to contain traces of arsenic, is poured through the funnel. The gas is tested by holding filtering-paper, wetted with a solution of nitrate of silver at the capillary aperture of the tube. If arsenic is present, a minute black spot appears. This may, however, be due to antimony. If owing to the presence of sulphur, the spot will be brown, and the gas will discolour paper moistened with a solution of acetate of lead.* The tube may now be heated red-hot within half an inch of the contracted portion, taking care that the contracted or capillary part of the tube, which is to receive the arsenic, is not overheated. A metallic deposit of arsenic is soon formed in the narrow portion of the tube. From the 1-1000th to the 1-2000th of a grain of arsenic may have its presence thus indicated.

When the quantity of arsenic is at a minimum, no other evidence than this thin metallic deposit may be obtainable. In general, however, besides the metallic deposit as a result of heat, it will be found, by passing the gas through a bent tube into nitric acid until the acid liquid in the apparatus is exhausted, a sufficient quantity of arsenic acid may be obtained, on evaporation, to admit of the application of the silver test, and the production thereby of the red arseniate of silver.

Whether the arseniuretted hydrogen is coming over, or has ceased to come over, is a fact which can always be determined by the application of filtering-paper, wetted with the nitrate of silver, to the open end of the tube from which the gas is issuing.

Various experiments were tried in order to determine whether other reagents might be used for oxidizing arseniuretted hydrogen and producing arsenic acid, in a form for testing. Solutions of chlorine and of chloride of lime in water were found to stop it only partially. Nearly one half of the gas escaped decomposition. On evaporating the liquids to dryness, some time after arseniuretted hydrogen had been passed into them, arsenic acid was readily proved to be present in the residues, by the addition of nitrate of silver.

* In all cases, it will be found convenient to dry the arseniuretted hydrogen gas by means of a chloride of calcium tube attached to the apparatus. A piece of lead-paper, introduced at the mouth of this tube, will effectually stop any sulphuretted hydrogen that may be produced. It may here be observed, that neither arseniuretted, antimoniuretted, nor phosphuretted hydrogen darkens a solution of acetate of lead; and it is always proper to test the gas by lead-paper applied to the open end of the conducting-tube, before passing the current into a solution of nitrate of silver. Sulphuretted hydrogen would otherwise cause thick black flakes in the solution, and might give rise to an error respecting the presence of arsenic.

In cases in which the quantity of arsenic is sufficiently large, a tube with a stop-cock may be resorted to. This gives a command over the rapidity of the current.

The zinc which has been used in one experiment is not fitted for use a second time. Some arsenic is always deposited upon it, which is evolved when hydrogen is again generated. I have substituted aluminum with hydrochloric acid as well as potash, but I have not found this new metal to present any advantages over zinc It contains no arsenic, but much iron and carbon.

Bromine acts in a similar manner. Iodine has no effect. Solutions of the chlorides of gold, platina, and mercury, of permanganate of potash, of sulphate of copper, and iodic acid, were successively used for receiving the arseniuretted hydrogen. The gas underwent decomposition in all of these solutions, but only to a partial extent. Among those above enumerated, the solution of chloride of mercury, as stated by Berzelius more than thirty years ago,* appeared to have the greatest power in arresting and fixing the arsenic. The results of these experiments were, that no liquids so completely oxidized arseniuretted hydrogen, without loss, as nitric acid and a strong solution of nitrate of silver. When the current was properly managed, not a trace of the gas escaped.

Quantitative analysis.—If the quantity of arsenic present is moderately large, it may be determined in the first stage, viz. by adding to the distillate containing chloride of arsenic a sufficient quantity of a solution of chloride of gold, and warming the mixture. After some time the gold is entirely reduced and precipitated. Its weight will enable the operator to calculate the proportion of arsenic present.† If there is a ponderable quantity of arsenic present, the distillate, or an aliquot part of it, should be diluted, placed, with metallic zinc, in the apparatus described, and the gas produced, entirely transmitted into strong nitrico-nitrous acid. When all the arsenic has come over, the acid should be evaporated in a light balanced capsule on a sand-bath, and the weight of arsenic may be known by the increase. If converted to arseniate of silver, and the quantity is sufficient for collection on a filter, this precipitate may be dried and weighed. Every 100 parts of the arseniate of silver are equivalent to 21.38 parts of arsenious acid. In reference to imponderable quantities, the only method of estimating the quantity of arsenic is the comparing of the amount of metallic deposit obtained by heating the current of arseniuretted hydrogen with the amount obtained from a weighed quantity of arsenic, dissolved in water, and treated in a similar manner.

For determining the quantity in the tissues, a known weight,—one hundred grains of dry liver, may be distilled:—the chloride obtained converted entirely to hydride, and this, decomposed by passing the gas into nitric acid until the arsenic is exhausted. The residue left by evaporation will be arsenic acid, of which 100 parts correspond to 65.2 of arsenious acid.

Objections.—This process appears to be singularly free from the objections to which those of Marsh and Reinsch are exposed. In the first stage, if properly conducted, arsenic is separated from all metals excepting antimony and bismuth, and from all metalloids excepting sulphur, phosphorus, and that rare substance, selenium. Of all the metals known, fourteen produce volatile chlorides; but, with the exception of arsenic, antimony, and bismuth, these are deposited on cooling, in a solid condition. Most of these are chlorides of the rarer metals, which are not likely to be met with in any analysis of a medico-legal nature. The chloride of arsenic is volatile, and is easily distilled with aqueous vapour: the chlorides of antimony and bismuth require a much higher temperature for volatilization; and unless the material is distilled to dryness and subsequently heated, they are not likely to be found in the acid distillate.‡

In the second stage, antimony comes over with hydrogen, like arsenic. The only other metals which combine with hydrogen to form a gas are potassium, tellurium, and zinc; and among the metalloids, sulphur, selenium, phosphorus,

* "Traité de Chimie," 1829, tome ii., p. 437.

† See Will's "Guide de l'Analyse Chimique,' 1858, p. 66.

‡ Ten grains of subnitrate of bismuth were distilled by a sand-bath with two drachms of pure hydrochloric acid. A small piece of polished copper boiled in the distillate, diluted, was only faintly whitened. Ten grains of protochloride of tin were distilled with two drachms of pure hydrochloric acid. The acid liquid produced no change on metallic copper by Reinsch's process.

and carbon. When heat is applied to the current of gas, the only substance deposited in a form to be mistaken for arsenic is *antimony*. The other substances present no difficulty whatever. Their colour, and their other physical properties, as well as the absence of any crystalline sublimate on heating to about 400° the deposit obtained by heat, at once distinguishes them from arsenic. The deposit produced by heat from the hydrogen-compound of antimony is blacker than that procured from arsenic; and if air is not entirely excluded at the time of heating the tube, some oxide, of a greyish-white colour, is at the same time deposited. The antimonial deposit is known from that of arsenic by its requiring a high temperature for sublimation, and by its not producing octahedral crystals. It is simply converted to a white amorphous oxide, at a higher temperature than the arsenical deposit requires for its sublimation. If a sufficient quantity of oxide is obtained in the form of a sublimate, this may be dissolved in a solution of pure tartaric acid, and the antimony precipitated from this solution, as an orange-red sulphide, by a washed current of sulphuretted hydrogen gas. The crystalline sublimate from arsenic can be driven by heat to various parts of the tube; the amorphous deposit of antimony is fixed. Finally, these metals are entirely separated and distinguished from each other in the third stage. The antimoniuretted hydrogen received into strong nitric acid is converted into antimonious or antimonic acid, which is left as a white, non-deliquescent residue by evaporation of the acid. The residue is quite insoluble in water or alcohol; and thus any arsenic acid mixed with it may be separated from it by digesting the residue in watery alcohol, and filtering the liquid. If tested by nitrate of silver, in the capsule in which it is collected, no red-coloured precipitate is produced; but on adding a drop of ammonia, black antimonide of silver is immediately formed. The passage of antimoniuretted hydrogen into a solution of nitrate of silver causes the precipitation of the whole of the silver as a black antimonide. The filtrate precipitated by hydrochloric acid gives no precipitate with a current of sulphuretted hydrogen. By either of these methods, therefore, arsenic and antimony are discovered in traces, are known from each other, and can be separated from each other.

Arsenic acid and the alkaline arseniates, as well as the sulphide of arsenic, are not easily obtained in the form of chloride of arsenic by the distillation process. Some portion passes over as chloride of arsenic, but much remains unchanged in the retort. Arsenious acid and the arsenites, soluble and insoluble in water, are most readily obtained in the form of chloride. These compounds chiefly concern the medical jurist. To one case of poisoning by arsenic acid or the sulphide, there will be at least one hundred cases of poisoning by arsenious acid. Should it be required to distil arsenic acid or its compounds, it will be advisable to convert it to arsenious acid by a current of sulphurous acid, or by the addition of bisulphite of soda. Sulphide of arsenic may be similarly transformed by being first treated with nitro-hydrochloric acid.

(*To be Continued.*)

REPORT OF THE
RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION,
AND OF THE
APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

On the Estimation of Phosphoric Acid.—Some time back* we described a process for the estimation of phosphoric acid, which had been published by M. G. Chancel. This process, which depended on the separation of the phosphoric acid as phosphate of bismuth, appeared to possess a great advantage over those in common use, inasmuch as it permitted the precipitation to be effected directly in the presence of free nitric acid, thus offering great facilities to the analysis of insoluble phosphates.

* *Pharmaceutical Journal*, 2nd series, vol. i., p. 608.

By this method, the phosphate is dissolved in dilute nitric acid and solution of nitrate of bismuth added; the phosphate of bismuth ($Bi\ O_3$, PO_5) so thrown down, being perfectly definite and constant in composition, is simply collected, calcined, and weighed. The presence of hydrochloric and sulphuric acids interfering with the accuracy of the process, they have to be removed previous to effecting the precipitation.

M. Chancel now publishes some further details in connexion with this process. He indicates that the presence of iron *in the state of persalt*, introduces another source of error; the phosphate of bismuth going down in that case with difficulty, and carrying with it some of the oxide of iron. This obstacle may, however, be entirely overcome by reducing the persalt to the state of protosalt, which is most easily effected by sulphuretted hydrogen. Adopting this precaution, the author states that the process may be employed with complete success in all cases, and may be applied to the analysis of ashes, soils, coprolites, mineral waters, iron ores, &c.

The following is the method of operating recommended by M. Chancel for the estimation of phosphoric acid in the most complicated cases:—

Heat the weighed substance with strong nitric acid (which will convert the metal and pyrophosphoric acids, if present, into the tribasic acid), drive off too great an excess of the acid, dilute with water, and, if necessary, filter. Eliminate from the diluted solution, first the sulphuric acid by means of nitrate of baryta; then the chlorine by nitrate of silver, collecting each precipitate on a filter. That done, the iron is next reduced to the state of protosalt by passing a current of sulphuretted hydrogen in excess through the filtered liquid. The excess of silver which had been added is precipitated, together with any other metals which may be present, the sulphides of which are insoluble in the acid solution. From a number of experiments, the author has ascertained that the iron is always completely reduced under these circumstances, even when the liquid contains a large excess of free nitric acid. The action is complete when the precipitate has agglomerated and the liquid is quite limpid. Before filtering, it is necessary to expel all sulphuretted hydrogen from the solution; this result is rapidly obtained by passing a current of carbonic acid through, until the gas which escapes ceases to blacken acetate of lead paper. Under these conditions, the estimation of the phosphoric acid is exact, and presents no difficulty. It is effected by adding to the filtered solution an excess of acid nitrate of bismuth, allowing the precipitate to deposit, then collecting it on a filter, and, after washing with boiling water, drying, calcining, and weighing. The nitrate of the protoxide of iron having a remarkable stability, there is no fear of the peroxidation of the iron before the addition of the acid nitrate of bismuth, provided that we operate at the ordinary temperature. The liquid may even be raised to the boiling point after the phosphate of bismuth has subsided, without inconvenience; the peroxide of iron which is then formed does not interfere with the determination of the phosphoric acid. The filtered liquid is again treated with sulphuretted hydrogen, which removes the excess of bismuth. The other bases may then be estimated in the filtrate by the ordinary processes. These several operations are very simple, and may be rapidly executed. This process may equally be used for the simple detection of traces of phosphoric acid in mineral waters, iron ores, &c. The precipitate of phosphate of bismuth may be diffused through water, decomposed by sulphuretted hydrogen, and the filtrate tested with nitrate of silver. The author now recommends the following method for preparing the test solution of acid nitrate of bismuth:—Dissolve 68.45 grammes of neutral crystallized nitrate of bismuth (BiO_3, 3 NO_5 + 10 HO) in a quantity of nitric acid, representing 68.5 grammes of anhydrous nitric acid, and add water until the solution occupies exactly the volume of a litre. Each cubic centimètre of the reagent thus prepared will precipitate one centigramme of phosphoric acid.

On the Preservation of Platinum Crucibles.—Every chemist is familiar with the peculiar grey coating which forms upon a bright polished platinum crucible when it is heated in the mixed gas flame. Some even have looked upon it with anxiety, thinking it would affect the weighings to be afterwards made with the crucible. M. Erdman has been engaged in examining this coating. He states that it is not due to the action or deposition of any foreign body upon the platinum, but that it is

produced by an alteration in the molecular construction of the metal itself; the surface becoming, to a certain extent, loosened and disintegrated by the heat. The coating, when formed over the entire surface, does not in the slightest degree affect the weight of the vessel; neither can it be removed by fusion with bisulphate of potash or carbonate of soda. When examined under the microscope, it is seen to consist of a roughened warty condition of the metallic surface. M. Erdman recommends that the coating should be removed each time it is formed, by cleaning the vessel with well-worn sand. He states that no appreciable amount of metal is lost by this scrubbing, but that the grains of sand act like little burnishers, flattening down again the loosened surface. A writer in the *Chemical News* states, in connexion with this subject, that "a remarkably rapid and perfect method of cleaning platinum apparatus, consists in gently rubbing upon the dirty metal a small lump of sodium amalgam. Sodium has the curious property of lending to mercury the power of 'wetting' platinum in so complete a manner, that the positive capillarity between platinum and an amalgam containing only a few per cent. of sodium appears to be as great as between mercury and zinc, with this important difference, however, that in the former case the wetted metal does not suffer the least trace of amalgamation. When the amalgam has been rubbed on with a cloth, until the whole surface is brilliantly metallic, water is applied, which oxidizes the sodium, and allows the cohesion of the mercury to assert itself. On wiping the mercury off, the platinum surface is left in admirable condition for the burnisher."

On a Means of Detecting the Presence of Castor Oil in the Volatile Oils.—We have received a communication from Mr. H. N. Draper on this subject. Castor oil, according to the author, may be used to adulterate volatile oils, and if so used its presence could not be indicated by those means applicable to the detection of other fixed oils, on account of its solubility in alcohol. He has therefore devised a test for this oil, based on the production of ænanthylic acid. This body is a product of the oxidation of castor oil, and is formed when the warm oil is treated with an excess of nitric acid. A violent action ensues, during which much nitrous acid is disengaged, and there is found floating in the acid liquid, when the residue is mixed with water, a soft unctuous mass. If the acid liquid be neutralized with carbonate of soda, so as to entirely remove the odour of nitrous acid, the smell of the ænanthylic acid can be most clearly recognized. The mode of applying this test to the detection of castor oil in the volatile oils is as follows:—Twenty drops of the suspected oil are placed in a capsule, and heated on a sand-bath, until the odour of the oil is no longer perceived. To the residue—if there be any—add five or six drops of nitric acid, and as soon as the action has subsided, dilute with solution of carbonate of soda. If castor oil be present, the odour will be at once perceived, and, once smelled, is not likely to be mistaken for any other. The author states that five per cent. of castor oil in a volatile oil can be thus detected.

On Sugar in the Urine.—At a recent meeting of the Chemical Society, a paper was read by Dr. Bence Jones on the presence of sugar in the urine. The author described a number of experiments which he had undertaken, with a view, first, of ascertaining the most delicate process for the detection of minute traces of sugar when added to urine; and secondly, for obtaining further proof of the correctness of Brücke's statement, that sugar is always present, and is a normal constituent of healthy urine. His principal conclusions were as follows:—Lehmann's process for detecting sugar in the urine by extracting the evaporated residue with absolute alcohol, and precipitating the sugar therefrom in the form of potash sugar, by means of alcoholic potash, cannot be employed when small quantities of sugar are present in large quantities of urine. The process of fermentation is stopped by the residue of the urine, by much urea, and still more decidedly by oxalate of urea. Half a grain of sugar in water can be detected by the alcohol produced, and may be estimated by the carbonic acid produced; but much larger quantities may be entirely overlooked in concentrated urine. In decolorizing urine for examination in the polarizing saccharometer some sugar is always lost. Animal charcoal removes sugar in proportion to the amount of charcoal used. This sugar may be recovered by washing with boiling water. Two-thirds of the sugar in urine may be lost by Robiquet's method of decolorizing with basic acetate of lead and ammonia. Petten-

kofer's test for sugar by means of cholic or glycocholic acid and sulphuric acid is the most delicate known. Two-thirds of a milligramme may be detected in a little distilled water, and the presence of a small amount of urinary colouring-matter does not affect the reaction. Trommer's test with sulphate of copper and potash is capable of discovering $\frac{1}{20}$th of a per cent. of sugar in urine, but when very small quantities of sugar are in solution with muriate of ammonia or urea, the reduction of the oxide is not perceived. Brücke's alcohol process was not found to be satisfactory, but his lead process furnished excellent results. The urine is precipitated first with neutral acetate of lead, then with basic acetate of lead, and lastly with ammonia. The ammoniacal precipitate contains the sugar which is extracted by treating the precipitate with oxalic acid, or preferably by sulphuretted hydrogen. By Brücke's process one-seventh of a grain of sugar added to 200 cubic centimètres of urine could be detected, and two-thirds of all the sugar added could be recovered. Moreover, the sugar is obtained free from salts, so that it can be fermented, and free from colour, so that it may be examined by the saccharometer. The presence of sugar could be readily ascertained by this process in 1000 cubic centimètres of urine. The sugar separated by Brücke's process from 1000 centimètres of the urine of a healthy man was estimated by the reduction test to vary from 1.4 to 2.2 grains, and in that of another man to vary from 2.3 to 3.0 grains. The sugar separated from 5000 cubic centimètres of the urine of one healthy man gave from 7 to 8 degrees of rotation in the saccharometer, and that of another healthy man from 10 to 11 degrees. The sugar extracted from 14,000 cubic centimètres of healthy urine yielded by fermentation 1.8 grains of carbonic acid, together with a recognizable quantity of alcohol. These and other experiments fully confirmed Brücke's statement as to the habitual presence of sugar in healthy urine. Hence diabetes must be regarded as an exaggeration of a healthy state, and not as a distinct and peculiar condition of the system.

ON THE PROXIMATE ANALYSIS OF PLANTS AND VEGETABLE SUBSTANCES.

BY FREDERICK ROCHLEDER, M.D.

(*Continued from page* 220.)

b.—Watery residue after the removal of the alcohol from the spirituous extract or decoction.

This fluid is diluted with a little water, and precipitated with *a solution of sugar of lead*, the precipitate collected on a filter, the filtered liquid mixed with *basic acetate of lead* as long as a precipitate results; and this second precipitate is also separated from the fluid by a filter. The filtered liquid is freed from lead by sulphuretted hydrogen, from sulphuret of lead by filtration, and from sulphuretted hydrogen by heating it. This fluid, as well as both the precipitates obtained by sugar of lead and vinegar of lead, are treated precisely as the precipitates and fluid were treated which were obtained by the corresponding treatment of the watery decoction of the material to be examined.

It is here to be remarked, that by the examination of this precipitate, as well as those obtained by sugar of lead and vinegar of lead, substances will be found which have been also found by the examination of the precipitates obtained from the watery decoction. Thus far, this examination is a control of the previous one. However, these precipitates generally exhibit a less complicated composition than those obtained from the watery decoction. The spirit does not dissolve many salts —namely, of the inorganic acids, sulphuric acid, phosphoric acid, &c. The pectine bodies are quite as little dissolved by spirit. In the precipitate obtained by sugar of lead, certain bodies are also absent which are precipitated by sugar of lead from the watery decoction. On the other hand, no gum is dissolved by spirit, as well as some allied substances, which would be contained in the watery decoction, and then would pass over into the precipitate which vinegar of lead produces in the watery decoction. For the preparation of many bodies it is, therefore, much better to use the precipitates which are precipitated from the watery residue of the spirituous extract than the corresponding precipitates from the watery decoction.

Although we often obtain useful results by following the prescribed method of examination, on the contrary it will happen in many cases that this prescribed method is not the best, and must be replaced by another which renders possible the separation of bodies, which cannot be accomplished with the same precision in the method given. Particularly when colouring matters are contained in the spirituous extract, their isolation by the methods already described cannot be performed quickly or perfectly.

In such cases, *the hydrate of alumina* is often employed with remarkable results for a preliminary separation of the constituents. This is prepared by precipitating a solution of alum with sulphide of ammonium, the precipitate is washed at the commencement by decantation, and then washed on a filter with water, and removed from the filter in a moist gelatinous condition. It can be preserved in closed vessels for use in a *moist condition*, or at once employed; the gelatinous hydrate is rubbed with water, which is added by degrees in small quantities, to a smooth thin paste. This is added to the watery fluid which has been obtained after the distillation of the spirit from spirituous extract of the material under examination, and after the removal of the fatty and resinous separations by filtration, the hydrate of alumina is diffused equally through the fluid by stirring, and allowed to remain in contact twenty-four hours, with frequent stirring. At the expiration of this time the fluid is filtered from the alumina, which is washed on a filter with water; the filtered liquid, as well as the alumina on the filter are subjected to further examination. There are bodies which combine with alumina, and others which form no combinations with it. The bodies which can combine with alumina are on the filter with the alumina, which has been added in excess in the form of salts of alumina, or are retained by the alumina in the same way that many bodies are fixed by charcoal or sulphuret of lead. *The mixture of alumina and alumina compounds* is treated precisely as the alumina precipitate which has been obtained by the alum and ammonia from the watery decoction. *The liquid which is filtered from the alumina and its compounds* is precipitated with *vinegar of lead;* this precipitate is separated from the fluid by filtration, the fluid from the lead *by sulphuretted hydrogen*, and freed from the sulphuretted hydrogen by heat after the sulphuret of lead has been filtered off. This lead precipitate, and the fluid filtered therefrom, are treated like the corresponding fluid and precipitate were treated when no alumina had been previously added to the aqueous residue of the spirituous extract. Frequently, in the spirituous extract there are two colouring matters present, one of which has the nature of a resin. Such colouring matters separate cotemporaneously with the fats and resins, when the spirit is distilled from the extract, and they are isolated in the examination of the resins. Many colouring matters remain dissolved in the water after the spirit is distilled off. This case often occurs that one of the colouring matters is completely taken up and retained by the freshly-precipitated alumina, with other bodies, when a sufficient quantity of alumina has been added to the fluid, while the other colouring matter remains behind in the fluid. The latter is then precipitated with other bodies by the addition of vinegar of lead. In the majority of cases, *the colouring matter* is retained by the sulphuret of lead after the decomposition of the precipitate by sulphuretted hydrogen, so that it can be *extracted by hot alcohol from the sulphuret of lead*, after the removal of the other constituents by water.

VI.—*Examination of the etherial extract.*

The extract of the material under examination, after the ether has been separated by distillation in a water bath, may leave mostly fats or resins, or a mixture of both. It frequently contains small, seldom large quantities of other bodies, which are dissolved equally by water or spirit, and are found in the watery decoction or spirituous extract. Free acids, organic bases, and many indifferent bodies may be taken up by the ether. *The residue which remains after distilling off the ether* is consequently first *boiled* with *water*. Tannin and analogous bodies, many vegetable bases and other substances, are taken up by the water, while the fats and resins remain undissolved. The watery solution of the etherial extract is treated precisely as the watery decoction of the material under examination. *The residue insoluble in water*, after the separation of all the water, is submitted to a further examination. A *portion* thereof is treated with sulphuret of carbon, to ascertain whether a separation can be thereby effected into two parts. If no separation is possible, *the*

whole, after treating the remaining portion of the etherial extract with water, is treated, or when a separation has been accomplished, by sulphuret of carbon; then the portion insoluble in sulphuret of carbon by itself, and the portion which remains after distilling off the sulphuret of carbon by itself, are treated as described for the mixture of fats and resins, which is obtained from the material under examination by extraction with spirit, and cooling the extract, or by distilling off the alcohol. (See pages 276 to 281.)

VII.—*Examination of the extract made with spirit containing potash or ammonia.*

The solution which is obtained by spirit containing potash or ammonia is sometimes very suitable for the pure preparation of substances which could only be procured with difficulty in a pure condition from the material under examination in another way. There are substances whose isolation is hereby attempted which are difficultly soluble in strong spirit, but dissolve considerably by the agency of potash or ammonia, so that the greatest portion of them are separated from such solutions by an acid, whilst others extracted by the same means and at the same time are not precipitated by an acid, because they remain dissolved in a free condition in alcohol diluted with much water. Frequently carbonic acid suffices to decompose the compounds of these substances with potash or ammonia, so that carbonate of potash and the substance which was combined with the alkali are together separated. Sometimes stronger acids, as acetic, sulphuric, or hydrochloric acid, are necessary for the decomposition. At first, therefore, *carbonic acid* is always conducted into the alkaline spirituous extract, to see whether a precipitation of organic substance takes place. When this is the case, the precipitate is filtered off from the fluid and examined more closely. The filtered fluid is mixed then with hydrochloric acid, to ascertain whether a precipitate is thereby produced. In this way it is possible to separate one or more weaker acids from stronger ones. The precipitate produced by hydrochloric acid must be separated from the fluid by filtration, and the filtrate should be further examined. Various peculiar bodies are rapidly obtained in this way pure; for example, crysophanic acid from rhubarb and parmelia parietina, also usnic acid and analogous bodies from many lichens. The preparation of these bodies is in no other way so easily and rapidly performed as in this manner. Naturally the precipitates produced by hydrochloric acid, as well as by carbonic acid, may be not only one substance, but a mixture of several bodies of that kind, and it is therefore necessary to learn whether by treatment with *alcohol, ether, and water*, a separation is possible or not into several constituents. When it is not possible to effect a separation of the mixed bodies, by their unequal solubility in these solvents, then a solution of the mixture is made in that menstruum which most readily effects its solution, such as ammoniacal water or ammoniacal spirit, and the separation is accomplished by fractional precipitation with a suitable metallic salt. In this case it is necessary to take care that no excess of ammonia is present. *Solutions of acetate of copper, acetate of lead, or chloride of calcium* are generally the most suitable salts for fractional precipitation. By a preliminary experiment it may be learnt which is the best to employ.

By the prescribed treatment of the extract whose preparation was explained in page 612, vol. i., a number of substances has been prepared, all of which cannot be regarded as isolated constituents, although such is the case with many of them. Substances which have separated from others, by following the methods described at page 24, are frequently obtained in a state of contamination with small quantities of other constituents. But as we have prepared these bodies from different extracts of material, according to different methods, generally twice or oftener, their peculiarities may still be recognized, even when the substance has in no case been obtained quite pure, because the impurities from the different methods of preparation must be various. After following the directions given, and from the evidence thus obtained, it is often impossible to know whether we had to do with one individual body or several bodies. Thus, by the fractional precipitation or solution of precipitates, it must often be felt undecided whether the individual solutions or precipitations contain the same or different bodies; and when the presence of several bodies has been detected in the different solutions or precipitates, whether these individual portions are to be fractionized still further or

not by a repetition of this kind of treatment, after we have not succeeded in the isolation of a single body, or attained the object in view. As we can now obtain conclusions, by the aid of reagents, on the relations of these bodies, and as these reagents will serve for this purpose in the majority of cases, they are treated of in the following section.

Section III.

Reagents and their application.

It has been often stated in the second section that a further examination of a body, by the observation of its behaviour to reagents, is required, not merely to decide by its reactions the identity of a body with one already known, but chiefly to prevent constituents being overlooked by the aid of their reactions.

If we have obtained a substance by fractional solution of a precipitate, or by fractional precipitation, of which we could not previously know whether it is only one body or a mixture of two, three, or several bodies, and have divided it into several portions, and allowed a number of reagents to act on each portion, we shall be able to ascertain whether we have to do with one or several bodies differing from one another.

I am certainly far from believing that only the reagents described in the following pages are useful means for the attainment of this object, but I have there described a number of reagents which are serviceable in the majority of cases, whose behaviour is known to organic bodies, and which every body is in a position to prepare or to procure more readily than others. I have only appended those remarks to each test which did not appear superfluous in reference to the objects of the present instructions for the analysis of vegetable substances.

1. *Perchloride of iron*, prepared by dissolving dry crystalline perchloride of iron in water. A great number of organic bodies affords with a solution of perchloride of iron, when it is added to their aqueous solutions, neither a precipitate nor a coloration. Many of the most widely-spread constituents of plants behave in their aqueous solution exactly as though this reagent was added to pure water. On the contrary, not a few compounds exist which give with this reagent a remarkable coloration, or are entirely precipitated, whereby the colour of the precipitate is generally a conspicuous one. There cannot be any conclusion drawn on the nature of a body which is contained in this solution, from the coloration which a solution of perchloride of iron assumes, or from the colour of the precipitate produced by this reagent. Morphine, gallic acid, and the aldehyde of salicylic acid, bodies which belong to three different classes, behave very analogous to a solution of perchloride of iron. Nevertheless, this reagent is very serviceable, inasmuch as bodies which produce with other reagents very few characteristic reactions, show by this reagent when they are mixed with very small quantities of other bodies. A great number of vegetable substances afford, when their aqueous solutions are mixed with a solution of perchloride of iron, a dark green or blue coloration, as is well known. Tannin, gallic acid, and many other similar bodies, exhibit this behaviour. Other substances acquire an intense red colour when their solutions are mixed with perchloride of iron. It is always advisable to add the perchloride of iron in very small quantities to the fluid under examination, as frequently the colour which makes its appearance by a smaller quantity of this salt is destroyed by a larger quantity. There are substances which, by the addition of this reagent, acquire an intense colour, but the colour soon disappears again, and cannot be reproduced, while with other bodies a coloration results which long remains unchanged. The coloration effected by perchloride of iron is often made to disappear more quickly by the application of heat. The coloration which is developed by perchloride of iron in the solution of a substance is often quite different, according as the substance is present in a free condition, or combined as an acid to a base. Frequently it depends on the nature of this acid or base whether a coloration is developed or not. It is a known fact, that all morphine salts do not exhibit an equally intense blue coloration when mixed with perchloride of iron, which is shown with many morphine salts every time this reagent is added. Kinic acid in a free state, in an aqueous solution, is coloured intensely green by perchloride of iron, while after its neutralization with ammonia it assumes a violet colour. Reference

must be made to these circumstances in the employment of perchloride of iron. The perchloride of iron itself is distinctly coloured yellow in considerably diluted aqueous solutions. On this account, it is necessary to prevent any excess of this solution, as otherwise misconceptions will arise; for example, a blue coloration should be observed, but instead of it a green makes its appearance, because the blue coloration which the substance and the perchloride of iron produce is converted into green by the yellow of the solution of perchloride of iron which has been added in excess. Further, it is always convenient to add a little ammonia to the fluid which has assumed a distinct colour with perchloride of iron, to observe the appearances which are thereby developed. The green or blue coloration is changed by perchloride of iron sometimes into a dark violet, sometimes into a black, and sometimes into a red. Thus the presence of two substances can be rendered evident, which behave in a free state quite the same as perchloride of iron.

2. *Perchloride of tin.*—The aqueous solution of perchloride of tin produces no coloration in the watery solutions of many substances, and also no precipitates; on the contrary, in the solutions of other bodies, a characteristically coloured precipitate frequently results thereby, sometimes only after the addition of a little ammonia. Frequently, by heating a solution after the addition of perchloride of tin, a precipitation results which contains no longer the original substance, but a decomposition product of the substance combined with oxide of tin.

3. *Protochloride of tin.*—The protochloride of tin, as a powerful agent of reduction, produces, particularly at elevated temperatures, changes of colour, which indicate the presence of a body which otherwise might have been overlooked. By this reducing action a coloured fluid often results. In many cases the addition of a little free alkali assists considerably the action of the protochloride of tin.

4. *Nitrate of silver.*—By the watery solution of this salt a precipitate of a silver compound, insoluble in water, often results in solutions, particularly after the addition of a little ammonia. Many of these silver salts are almost immediately decomposed under the separation of metallic silver, others only under the influence of a higher temperature. The silver separates thereby sometimes as a shining mirror, sometimes as a pulverulent black mass. This varied behaviour of the different constituents of vegetable substances to the solution of nitrate of silver, by the presence and absence of an alkali, permits the employment of this salt likewise for the detection of individual constituents in a mixture.

5. *Acetate of lead.*—The neutral acetate of lead is employed as a watery as well as a spirituous solution; for the latter, spirit of specific gravity .825 is used. The majority of organic substances are precipitated by sugar of lead from a watery or spirituous solution. One part of the lead compound, insoluble in spirit or water, dissolves in acetic acid; another part does not. A part of the lead compound insoluble in water, dissolves in alcohol; on the contrary, a part of the lead compound, insoluble in spirit, dissolves in water. By the decomposition of lead compounds which are precipitated from their watery solutions by alcohol, and by the decomposition of lead compounds which are precipitated from their alcoholic solutions by water, the separation of substances is effected which were contained in the lead precipitates together at the same time. When the decomposition is performed with sulphuretted hydrogen, the sulphuret of lead, like charcoal, retains often one or more of the constituents, while other constituents pass over into the fluid in which the lead compound was diffused before treatment with sulphuretted hydrogen.

6. *Basic acetate of lead.*—In general, what has been stated of the neutral acetate of lead is applicable to this reagent. A number of substances which are not precipitated by the neutral salt, give insoluble compounds by the addition of vinegar of lead to their watery or spirituous solution. As many organic substances which have a great tendency to reduce the oxides of the noble metals, and in combination with alkalies and alkaline earths absorb oxygen from the air, form with lead compounds which are less subject to such changes, both the lead salts are more suitable, in many cases, than other metallic salts to effect the decomposition and separation of substances. Concerning the basic acetate of lead, it is particularly to be mentioned that it precipitates substances from acid solutions because it saturates the free acid, and is converted into the neutral salt. These substances are *per se* insoluble in the fluid, and are only dissolved therein by the agency of an acid, so that the

precipitate may contain substances which do not form compounds with oxide of lead.

7. *Acetate of copper* can be used in many cases as the neutral acetate of lead, but seldom offers any advantage over it.

8. *Sulphate of copper* is employed in the same cases in which acetate of copper or acetate of lead is used, when the presence of acetic acid should be prevented in the fluid, because the sulphuric acid which is here introduced into the fluid by the reagent can be more easily and quickly removed than acetic acid. The application of sulphate of copper for distinguishing grape sugar and milk sugar from gum, cane sugar, and analogous bodies, is, of course, well known; but I may mention that the *alkaline solution of copper* as a reagent demands great care, because many substances effect a reduction and separation of the suboxide of copper, like grape sugar or milk sugar; on the contrary, other substances have not this reaction.

9. *Chloride of platina*, and

10. *Bichloride of mercury.*—These salts serve for the detection and separation of organic bases. (For the same object, under certain conditions, infusion of galls, nitro-picric acid, and sometimes sulpho-cyanuret of potassium are employed.)

11. *Carbonic acid, metallic oxides insoluble in water, carbonate of lead, carbonate of silver, carbonate of copper, and basic carbonate of lead*, are often employed for the separation of bodies. *Carbonate of zinc* and *carbonate of cadmium* are seldom serviceable. Many substances expel the carbonic acid from the carbonates, and form compounds partly soluble and partly insoluble; other substances drive off the carbonic acid quite as little at the boiling heat of water as at ordinary temperatures, whilst some other bodies are able to expel the carbonic acid in the heat, but certainly not in the cold. When, therefore, one or the other of the metallic carbonates named are brought into a solution of different bodies, compounds result partly soluble and partly insoluble, while a part of the organic substance remains dissolved in a free state. Many of the dissolved compounds are precipitated by alcohol from their watery solutions, and others are not, whereby a further separation is rendered possible.

12. *Bisulphites of potash, soda, and ammonia.*—These salts are prepared in solution, as concentrated as possible, by conducting sulphurous acid into concentrated solutions of the corresponding carbonates. They are partly employed to produce, with certain substances, compounds which are easily separated from the other constituents, which are not capable of combining with alkaline bisulphites. This is the case in the separation of the aldehydes from indifferent bodies which possess equal solubility in various fluids with the aldehydes. They are partly used with the co-operation of heat to change individual substances, whilst others remain thereby unaltered. Many substances which possess the same solubility as others, by this change lose their solubility in a fluid, so that the bodies remaining unchanged may now be readily separated from the unaltered ones.

It is necessary, when changes are produced by the action of the materials which afford a solid body by separation from a fluid, to always observe whether the separated substance contains or not sulphurous acid and an alkali. By this it may be concluded whether an insoluble compound, with alkaline bisulphites, results or not. As Knop has shown, many bodies break up by the action of alkaline bisulphites in the heat in a manner analogous to the action of free alkalies and acids in the heat. By this capacity to produce decomposition products, the alkaline bisulphites are quite as useful in investigations as by their capacity to form with many bodies alkaline salts under the expulsion of sulphurous acid, whose oxidation by the oxygen of the air is prevented by the presence of sulphurous acid, as Knop has observed with gallic acid and analogous bodies.

13. *Hypochlorite of lime.*—The chlorinated lime is employed as watery solution which has been separated from the undissolved hydrate of lime by filtration through clean asbestos. With many organic substances it produces characteristic colorations, which are often so very intense that a small quantity of a body can be recognized thereby in the presence of other substances. Lichens contain peculiar crystalline materials, some of which are remarkably coloured by chlorinated lime. With many bodies chlorinated lime produces no coloration. The chloride of calcium admixed has no influence in these reactions.

14. *Bichromate of potash.*—Bichromate of potash acts on many organic substances

at ordinary temperatures, on others only at a boiling heat. Many bodies undergo no change at higher temperatures with this salt. By this unequal behaviour of bodies to this oxidizing salt, it is suitable for the detection of many substances. Either changes of colour only, or also the separation of precipitates, are thereby observed, which latter consist frequently of a combination of oxide of chromium with a newly-formed product of oxidation. Frequently, peculiar odorous volatile oxidation products are formed, which are readily detected by reagents. When the salt does not act on a solution of one or more bodies even at the boiling heat of water, a little sulphuric acid is then added, by which an oxidation is effected, except in a few cases. Only a few bodies withstand the action of chromic acid, which is rendered free by the addition of sulphuric acid. The experiment with bichromate of potash, as well as with chromic acid, is best undertaken in a retort, or a flask connected with a refrigeratory apparatus and a receiver, to intercept the bodies which are volatile. Salicylic acid, kinone, &c., can be thus easily detected in the distillate. Substances which—as, for example, limonine—withstand the action of chromic acid even at high temperatures, are easily isolated from all other accompanying constituents, which thereby undergo decomposition.

15. *Caustic alkalies, the hydrates of potash and soda, as well as baryta*, are often very serviceable as reagents, partly in the form of an aqueous, and partly in the solid condition. Substances are dissolved by a solution of an alkaline hydrate which are insoluble in a free state in water or spirit; while other substances, insoluble *per se*, but dissolved in the form of a compound, are separated and precipitated by the alkaline solution. Potash, soda, and baryta, effect changes by bodies being heated in their solutions, which often afford conclusions on the nature of the bodies, and quite as often draw attention to the existence of a body which otherwise had remained unobserved. Ammonia, methylamine, and similar bases, are often thereby set free from nitrogenous bodies, sometimes affording a decomposition product which, with the alkali, forms an insoluble compound which separates. This takes place more frequently with baryta than with soda or potash. Indeed, often no such insoluble compounds result, but a soluble salt of a decomposition product is formed, which is *per se* insoluble in water, so that only after saturation with an acid a decomposition product is separated. As organic substances in contact with the air more readily take up its oxygen in the presence of strong bases than happens without the agency of these bases, it is necessary to exclude the air when the action of alkalies on organic substances is to be observed. Consequently, the bodies are heated with alkalies in vessels which are filled with hydrogen gas, in the manner explained in the treatment of certain bodies with baryta (page 215).

The disposition of many organic substances to oxidize with oxygen in contact with alkalies, can likewise be used for the detection of bodies. In these processes of oxidation changes of colour generally appear which are not easily overlooked.

16. *Ammonia.*—In its method of action, ammonia is closely allied to the bases above mentioned. In many cases it possesses a preference over them, in so far as an excess of it can be easily removed. Its action is generally less energetic than that of the fixed alkalies and baryta. Ammonia frequently acts in a peculiar way on organic substances, for many organic substances combine therewith under the absorption of oxygen and the separation of water, and produce sometimes brilliantly coloured compounds. In contact with many compounds, ammonia produces immediately characteristic colorations. The treatment of dry substances with dry ammoniacal gas, sometimes at ordinary and sometimes at higher temperatures, serves frequently for the detection of bodies which would otherwise remain unobserved, and for the recognition of bodies in other respects similar.

17. *Nitric acid.*—The acid acts in a concentrated condition very vehemently on almost all organic bodies. Their oxidation products, or substitution products, which contain NO_4 in the place of hydrogen, are thus produced. The body often splits up, and the products of this decomposition then undergo further changes. By the action of nitric acid many bodies assume very intense characteristic colorations, others do not; so that this acid can be used by this property for the recognition of bodies in mixtures with others. Nitric acid mixed with sulphuric is particularly suitable for the development of nitro-compounds.

18. *Sulphuric acid* is employed in a diluted as well as a concentrated condition.

The heated dilute acid splits up many bodies into decomposition products, although in this respect hydrochloric acid is much to be preferred. But it may be more readily and quickly separated from a liquid than hydrochloric acid, which in many cases demands care. In a moderately concentrated state it precipitates many forms of tannin from concentrated aqueous solutions, particularly when no acetic acid is present. It gives crystallizable salts with many organic bases, which, with the exception of the salts of methylamine, are soluble in alcohol. The dilute acids often effect in the heat, with some organic substances, an absorption of water, or rather of its elements; with others, an expulsion of hydrogen and oxygen in equal equivalents. In this respect its action has much resemblance to the action of alkalies.

The concentrated acid dissolves many organic substances without exercising any influence on their composition. When the substance is insoluble in water, it is often precipitated unchanged from such solutions by water. Sometimes the solutions even of colourless bodies are strongly coloured. Generally, the colour of the solution appears red; more seldom, violet or blue. The yellow or brownish-yellow colour is quite as frequent as the red. By the addition of water a more or less complete decolorization then generally ensues, with or without the formation of a precipitate. Sometimes, by the solution of a substance, a so-called copulated sulphuric acid is produced, which is found when the solution, diluted with water, is mixed with carbonate of baryta, lime, or lead, and the sulphuric acid salt, insoluble in water, separated by filtration from the fluid, which is then evaporated, whereby the salt of the copulated acid is left behind.

19. *Hydrochloric acid.*—The concentrated acid precipitates many organic substances from their aqueous solutions, but the precipitation is not generally so complete as that with sulphuric acid. More of the substance to be precipitated remains dissolved in the hydrochloric acid solution than is the case with the use of sulphuric acid. Acetic acid prevents generally the precipitation more or less, and sometimes entirely. The tannic acid of galls, and other analogous bodies, may be precipitated by hydrochloric acid. The dilute hydrochloric acid, at the boiling heat of water, splits up bodies, and in this respect it is not surpassed by any other reagent. Decompositions of this kind are most suitably undertaken in an atmosphere of carbonic acid. A more thorough decomposition, as happens so readily with sulphuric acid at the margin of the liquid, is not to be feared with hydrochloric acid. Hydrochloric acid affords with these decomposition products very little occasion for the formation of bye-products. Through the separation of a difficultly soluble or insoluble decomposition product, and by the peculiar colour of many such products, the means are given frequently to recognize and to direct attention to a body. Concentrated hydrochloric acid, as well as hydrochloric acid gas, like concentrated sulphuric acid, produce often a conspicuous coloration of bodies, which sometimes disappears on the addition of water, but sometimes is only slightly changed thereby, and in a few cases undergoes no alteration at all. Hydrochloric acid gas may be employed for the determination of the atomic weights of substances with which it combines; as, for example, organic bases and many hydrocarbons, of which some give therewith a crystalline, and others a volatile compound. In the latter case, hydrochloric acid may be employed for the separation of several such indifferent bodies. Hydrochloric acid is consequently the most generally applicable means for the recognition and separation of organic materials.

Before I pass to another reagent, I will only just remark that different organic substances which are split up by hydrochloric acid require an unequally long time for their decomposition, so that, by a gentle heat and a sufficiently diluted acid, one of the compounds is often entirely decomposed before the decomposition of the second has begun. In this way, consequently, it is frequently possible to recognize two substances mixed with one another whose solution could easily have been regarded as the solution of a single substance.

20. *Superoxide of lead, and superoxide of manganese.*—Both these superoxides, in a finely divided condition, frequently produce an oxidation of one or the other constituent in the heated watery solutions of substances, while some bodies are not thereby attacked. A few organic compounds withstand this oxidizing agent after the addition of dilute sulphuric acid. Volatile bodies often thereby form, as formic acid, kinone, &c., and frequently characteristically-coloured oxidation products;

as, for example, with strychnine. The formation of coloured oxidation products from many organic bases, which are produced by the action of superoxide of lead and sulphuric acid, depends, with the majority of these substances, upon an illusion. Quinetine, cinchonetine, morphetine, &c., result, by the action of sulphuric acid and superoxide of lead, from the bases concerned, only when the sulphuric acid or the superoxide of lead is contaminated with nitric acid. By the employment of pure reagents other decompositions are produced.

21. *Chlorine, bromine, and iodine.*—These three elements produce, partly by the indirect oxidation of the substance in the watery solution in which they are introduced, and partly by the substitution of hydrogen which they call forth, characteristic appearances of colour, or precipitations of insoluble oxidation or substitution products; consequently, they serve often for the detection of substances in mixtures.

22. *Gelatine.*—Solution of gelatine is employed for the precipitation of the different forms of tannin. A pure solution of gelatine is prepared by precipitating a solution of gelatine, to which a little hydrochloric acid has been added with alcohol, washing the precipitate with spirit, and dissolving the washed gelatine in water

23. *Infusion of galls* serves for the precipitation of organic bases, as well as for throwing down some albuminous substances from their solutions.

The employment of reagents will never lead to a complete knowledge of the composition of a vegetable substance, because, from the similar behaviour towards some reagents of a body discovered with one already known, no conclusion can be drawn on their identity. Reagents are serviceable for directing attention to the presence of substances, and reagents should show us the way of separating bodies which exist in a mixed state. In the second section it has been explained how we are to proceed with different decoctions and infusions of a material under examination, to separate up to a certain point the constituents from one another. Thereby it was necessary to speak of the application of some reagents. The description of the method of separating mixtures was often interrupted, and it was there stated that the further examination must be continued with the aid of reagents. If we had described in every case the method to its termination, a numberless quantity of repetitions would have been unavoidable. Besides, that which has been indicated above concerning the individual reagents, clearly shows in what manner and to what purpose each reagent shall be used, where in previous paragraphs it has been only briefly pointed out that reagents should be used for the further investigation. Assuming that by treatment of the precipitate with acetic acid, which sugar of lead produced in the watery decoction of the material under examination, we have the precipitate separated into a part soluble and a part insoluble in acetic acid, the part soluble in acetic acid precipitated by vinegar of lead into two portions, because by vinegar of lead a precipitate results when the fluid still reacts acid, while a second precipitate makes its appearance when the acid fluid is neutralized by the addition of vinegar of lead; assuming that by treatment of both lead salts with alcohol, we have separated them into a part soluble and a part insoluble in alcohol, and thus obtained four portions of lead salts of the precipitate from the part soluble in acetic acid produced by sugar of lead in the watery decoction of the material under examination; assuming that we have decomposed the part of this precipitate insoluble in acetic acid under water by sulphuretted hydrogen, the fluid filtered from the sulphuret of lead, freed from the excess of sulphuretted hydrogen, and thrown down ten lead salts by fractional precipitation with sugar of lead; we have prepared in this way fourteen lead salts from the single precipitate thrown down by sugar of lead in the watery decoction of the material under examination. By the decomposition of these lead salts with sulphuretted hydrogen, we have fourteen aqueous solutions, which are now to be tested with reagents. It is self-evident that certain reagents are not here required to be employed, because no representative can be contained in these fluids of the class bodies for which they could be used with results. We have found in the precipitate produced by sugar of lead partly inorganic and partly organic acids combined with lead, no indifferent carbohydrates and no bases, because their precipitation is prevented by the acetic acid rendered free. The vegetable acids existing generally as malic acid, citric acid, tartaric acid, fumaric or aconitic acid, the tannic acids, the acids corresponding to gallic acid, substances which are so widely spread in the vegetable kingdom, are contained in

this precipitate, by the investigation of the bark, the leaves, the stems, and the flowers of plants. Colouring matters, often formed by the oxidation of the various forms of tannin or their splitting up, are produced from colourless bodies. Gelatinous bodies of the class of pectine compounds are frequently present in this precipitate. Colouring matters and pectine bodies, by the decomposition of the lead compound with sulphuretted hydrogen, are often entirely retained in the sulphuret of lead, partly because sulphuret of lead acts analogous to animal charcoal, and partly because they were present in the watery decoction in the form of soluble salts. By precipitation with sugar of lead the base of the soluble salt is separated as an acetate, the acid precipitated with the oxide of lead, and retained by the sulphuret of lead, because in a free state it is insoluble in water. We return now to the fourteen fluids.

It is self-evident that we have not to deal with the solutions of fourteen peculiar bodies. Several bodies may be contained only in one, or at the most two of these solutions, but another constituent may exist in six or eight of the fluids, in each contaminated with one or more constituents, and perhaps in one of these fluids quite pure. It is only by a number of reagents that the truth can be learnt. It is clear that the same reagent must be always applied to all portions of the fluids. For example, we add a few drops of a solution of perchloride of iron to a little of each of the fourteen fluids which have been taken for this purpose. In several of the portions there results an intense, in some portions a less intense, in other portions no coloration, or there results in some of these fourteen fluids a different coloration by this reagent to that of the remainder. In the same manner we add a second reagent to portions of these fourteen fluids, and so forth. By these means it may be ascertained how many different constituents are contained in the fourteen fluids. It may further be discovered by what means each of the constituents present can be separated from the remainder. The examination can only be conducted further by the aid of elementary analysis. By elementary analysis alone can the identity of a discovered body, separated from its accompanying constituents, be proved and established with a known body. The similarity of many reactions is so great with many bodies, that we should regard those as identical which elementary analysis shows us are very different bodies; for example, two members of a series of homologous substances which stand next to one another in the series, &c. On the contrary, bodies often appear different in many of their properties from a known body, while we by elementary analysis are taught that a complete identity exists, and the difference in many properties is due to impurities which are present in such small quantities, that they have exercised no noticeable influence on the result of the analysis.

(*To be Continued.*)

ON THE OCCASIONAL POISONOUS PROPERTIES OF THE COMMON MUSHROOM.

Dr. Badham, we believe, first called attention in this country to the fact, that though *Agaricus campestris* is so generally received as a safe and wholesome species, it does not pass muster everywhere without challenge. In many parts of Italy there is a strong prejudice against it. Micheli, indeed, informs us that it is highly prized in Tuscany, where it has many names, while Vittadini states that it is little known in the Lombardo-Venetian districts, and was only introduced into the lists of Fungi recognized by the police in Milan and Pavia at his especial suggestion. In Rome it is not merely despised but is absolutely prohibited from appearing in the markets, and the prejudice against it is so universal that it is, according to Dr. Badham, a common saying of any one who has enmity towards another—"May he die of a Pratiolo!" the name by which the common mushroom is generally known in Italy.

It is just possible that it may have obtained its bad character there in consequence of its having been confounded with other species, but it is equally possible that the difference of quality may arise from local circumstances which cause an increase of development of the poisonous alkali on which the deleterious properties of bad mushrooms depend. Besides, there is a treatise, to which we have not access at present, though it was once placed kindly in our hands by Dr. Badham, in which

death is recorded as having been caused by the true mushroom, nor was there any reason to believe that the evil consequences were due to an accidental admixture of other species. The mushroom, moreover, is regarded with suspicion in Hungary and is seldom cooked, though *Boletus edulis*, a very inferior Fungus in our estimation, is largely used. In Vienna, on the contrary, it is used without any scruple. De Candolle, indeed, tells us (says Vittadini) that all the Fungi of the especial section to which *A. campestris* belongs, which have a complete or incomplete ring with gills at first rose-coloured, then ruddy, then brown, and at length black, are equally wholesome and incapable of being confounded with any poisonous species; but Micheli speaks of one agreeing in sectional characters under the name of *Fungus perniciosus*, whose nature is highly suspicious.

One of the principal uses to which the several forms of mushrooms are applied is the production of catchup, a name of Eastern origin. For this purpose the allied species or varieties are in general used indiscriminately, not to speak of more questionable adulterations, but there is an immense difference in the quality of the condiment produced from different varieties. The true mushroom of our pastures, and those varieties which afford a red juice when bruised, are far the best. The catchup merchants frequently keep the mushrooms salted down in casks for months before they are converted into catchup. In general, however, the more rapidly the juice is extracted the better is the produce, and the more likely to keep. It is a good practice to preserve it always in small stout bottles, such as will bear a good degree of heat before the corks are driven home.

Mrs. Hussey recommends a mode of preparing it, which she informs us is far superior to that in general use. The mushrooms, being first cleaned from all extraneous matter, and those being utterly rejected which border at all on decomposition, are sliced and salted, and the juice suffered to run off through a second colander without any squeezing. It is then left for a few hours, and after being decanted carefully from any sediment, placed in small bottles, room having been left for a little alcohol in which the proper spices have been previously steeped. This is said to keep admirably, and to retain its full aroma, which is apt to pass off in the process of long-continued fermentation or boiling.—*Gardeners' Chronicle.*

ASARUM EUROPÆUM A REMEDY FOR THE EFFECTS OF DRINKING.

BY DR. SMIRNOFF.

Dr. Smirnoff states that he has become convinced, from repeated trials, that the *Asarum europæum* well deserves the reputation it has obtained in Russia of being an excellent remedy for the effects of drinking.

The influence of a continuous abuse of alcoholic drinks is first exerted locally, but afterwards dyspepsia is produced; and the nutrition and functions of the entire economy, especially of the central portions of the nervous system, becoming interfered with, the blood itself being loaded with an injurious foreign material, the *dyscrasia potatorum* is at last completely established.

The *asarum* fulfils various indications, acting beneficially on the alimentary canal in those cases in which the digestive powers are so much at fault. Its aromatic principle confers upon it a stomachic power, and regulates the condition of the intestinal discharges, producing vomiting and purging when given in large doses. Its most beneficial action, however, is manifested on the defective appetite, and by its counteracting the invincible longing for alcohol. The horrible sensations with which the drinker awakes in the morning, and which compel him to seek temporary and delusive relief from renewed libations, are much blunted and mitigated by means of a glass of strong infusion of asarum and some other nervine —*e.g.* valerian. Its immediate effect is often to produce vomiting and sometimes purging; but the painful sensations at the epigastrium undergo relief, and the appetite becomes invigorated. Persons who have been long habituated to alcoholic drinks cannot, however, have these suddenly suppressed with impunity; and in such cases the author gives the asarum in brandy, applying at the same time a blister or an issue to the pit of the stomach. By this means the normal activity of the stomach becomes excited and the longing for alcohol diminished.

The author, however, cannot agree with those who would still allow a small

quantity of spirits to habitual drinkers, even when the morbid desire for it has become appeased. The continuous use of a decoction of asarum, even when it does not succeed in extinguishing the desire for alcohol, always supports the powers of the patient; and it is remarkable in some cases, in which the individuals have been long accustomed to periodical intervals of drunkenness, ending in delirium tremens, how much longer those intervals will become, and how much less likely delirium tremens is to recur. The patients themselves are sometimes surprised at the comparative impunity with which they can continue their drinking. The author prescribes three or four glasses a day of an infusion made with ℥iij. asarum root, ℥i. of valerian root, and ℥ss. of orange-peel, but he does not state the quantity of water employed. In cases of drunkenness, another formula is composed of decoction of asarum (made by boiling from ℥ss. to ℥j. of the root), ℥vj.; tincture of valerian, ℥ij. to ℥iij.; Sydenham's laudanum, gtt. xij.; syrup of orange-peel, ℥ss. A tablespoonful of this is taken every two hours. He finds from two to five grains of bismuth, taken four times a day, a valuable adjunct. He has also found the following popular Russian remedy of service in cases of drunkenness:—℞. Ammon. carb., ℥ss.; aceti vini, lbj.; oxymel scill. ℥ss. Two tablespoonfuls every two hours.—(*Med. Zeit. Russlands*, and *Med. Times.*)

ON THE USE OF THE LEAVES OF GLOBULARIA ALYPUM AS A PURGATIVE.

BY ARTHUR LEARED, M.R.I.A.,

Member of the Royal College of Physicians, London, Physician to the Great Northern Hospital, and to the Royal Infirmary for Diseases of the Chest.

An attempt has been lately made in France to revive the use of the leaves of Globularia Alypum as a purgative. Dr. Planchon, of Montpeliler, tells us * that the qualities which recommend them are, that they neither induce nausea, vomiting, nor griping, that they purge without irritation, while their bitter properties give them a tonic action. Above all, that the action of the medicine is unattended by subsequent constipation; and in twenty-two detailed cases in which the drug was administered, this appears fully borne out. It was this important circumstance which induced me to experiment with the medicine as one likely to enrich our materia medica. A sufficient quantity of the leaves was kindly placed at my disposal by Mr. D. Hanbury, jun., of Plough Court, Lombard Street.

Globularia was well known as a purgative in the middle ages, and also as late as the seventeenth century. Geiger says it was introduced into medicine from a belief in its identity with the Ἄλυπον of Dioscorides, a plant briefly described by him,† the fruit of which was used as a purgative. The plant was, however, commonly regarded as possessed of highly drastic qualities, and hence obtained the designations of Herba terribilis, and White turpith. No doubt for the same reason it became almost forgotten. Dr. Martius informs us, however, ‡ that Clusius, Garidel, and later writers, as Nissole (1712) and Ramel (1784), endeavoured to prove its harmlessness, and Ramel praised it as a febrifuge. De Candolle and Gillibert (1806) nevertheless pronounced it a violent drastic. Loiseleur-Deslongchamps, after a trial of the leaves upon twenty-four patients, affirmed it to be a mild evacuant. §

Lindley has placed the genus Globularia in the natural order Selaginaceæ, and in this Dr. Planchon concurs. G. Alypum is a small shrub of from one to two feet in height, found in many localities along the basin of the Mediterranean. The leaves are imported into Germany for some secret purpose in the arts, supposed to be tanning. These leaves, from their general appearance, are termed wild senna, but

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* Des Globulaires. Au point de Vue. *Botanique et Médical.* Par Gustave Planchon. Montpellier, 1859.

† The derivation of Ἄλυπον, from Ἄλυπος, *not causing pain*, is by no means consistent with the properties attributed to G. Alypum, it ought perhaps to be understood in the sense of *removing pain.*

‡ *Pharmaceutical Journal*, vol. xvi., p. 426.

§ *Biblioth. Médic.*, tom. xlviii., 1815.

they are smaller and more elongated than those of true senna. The venation is also less distinct, the epidermis thicker, and, by aid of the microscope, is seen to be thickly studded with white bodies supposed to be glands. The smell of the leaves is peculiar and somewhat aromatic—the taste very bitter. No accurate analysis appears to have been yet made, but a crystalline bitter substance has been discovered by Dr. Walz, and they also contain gallic and tannic acids. I prescribed the medicine to twenty out-patients at the Royal Infirmary for Diseases of the Chest. A decoction of one ounce (thirty grammes, Dr. Planchon) of the leaves boiled for ten minutes in about a quarter of a pint of water, was given for a dose. Subsequently half this dose was employed, and lastly a concentrated infusion, of which half an ounce in a diluted form was the dose. With one or two exceptions, the draught was always taken before breakfast.

From the results of its use the following deductions may be made. The interval between taking the dose and the first evacuation, as well as the duration of action, were, as might be expected, proportionate to the amount of the dose. Thus, excluding the cases in which the periods were not noted, when one ounce of the leaves was employed, the average interval was 2 h. 36 m., when half an ounce, 6 h. 6m.; and when half an ounce of the infusion was used, 9 h. 4 m.; and the average duration of action was respectively 25 h. 20 m., 9 h. 13 m., and 5 h. 5 m. The same relation was observed as to the number of stools, but other effects did not appear to have so completely coincided. In one case only the bowels were said to have been regulated. Constipation, varying from one to several days, occurred in thirteen cases, while the motions were more or less relaxed for one or more days in four; not mentioned in two. No griping occurred in five cases; slight griping in seven, while pain was more decided in the same number; not mentioned in one. Several of the patients were questioned as to diuretic and other effects, but nothing was elicited.

It is plain that in those cases in which the bowels were relaxed, on one or more days after the day of taking the medicine, the effect was due to a continuance of its purgative action. This happened especially after large doses, as employed by Dr. Planchon, and I can only attribute the great apparent discrepancy in our results to a different interpretation of the same cause. Like other purgatives of its class, G. Alypum has a decidedly constipating tendency. It possesses, however, no virulent properties, but appears a safe and efficient purgative, remarkable, perhaps, for the duration of its action. In its griping tendencies and the nature of the stools, it is allied to senna, but from its tonic properties I assign it a position intermediate between senna and rhubarb.—*Medical Review.*

ON METAMORPHIA, A NEW ALKALOID OF OPIUM.

BY G. C. WITTSTEIN.

In treating the residue from the preparation of tincture of opium with lime, according to Mohr's process, to obtain morphia, Scharf, an apothecary of Munich, obtained crystals whose solution in acids gave no precipitate with ammonia.

Wittstein has more closely examined this crystalline body. He first purified it by recrystallization, and determined it to be the hydrochlorate of a new base, which he calls metamorphia.

Hydrochlorate of metamorphia dissolves in 25 parts of water, at the ordinary temperature; the solution possesses a strong and pure bitter taste, and has a neutral reaction. It requires scarcely two parts of boiling water to dissolve it.

Alcohol of 90 p.c. Tralles dissolves at the ordinary temperature only half as much of the salt as water, one part requiring 48 parts of alcohol, whilst boiling alcohol dissolves as much as boiling water. In ether it is insoluble. Solution of ammonia dissolves it quickly and completely. Solutions of caustic potash, carbonate of ammonia, and carbonate of potash, have the same effect. It is very evident, therefore, that the aqueous solution of this salt is not in the least clouded by pure alkalies and their carbonates, even if they be diluted and gradually added. Perchloride of iron colours the aqueous solution blue, passing into grey. Chloride of gold produces in concentrated aqueous solutions a reddish yellow flocculent precipitate, which readily disappears on the addition of more water. Chloride of platinum gives a light yellow flocculent precipitate, which is also soluble in a larger quantity of

water. Bichloride of mercury causes a white flocculent precipitate, which does not become perceptibly less on the addition of more water. Tannic acid gives a yellowish white cloudiness to the solution, but not very marked. Concentrated sulphuric acid disengages from the salt much vapour of hydrochloric acid, but without colouring it; a dirty red colour is first produced by heat. Nitric acid of sp. gr. 1.33 immediately dissolves the salt with reddish yellow colour, which, however, soon becomes yellow.

By analysis, this salt gave an amount of chloride of silver, corresponding to 12.211 p.c. of hydrochloric acid. Hydrochlorate of morphia contains only 9.7 p.c., and hydrochlorate of codeia only 9.81 p.c. of hydrochloric acid. The equivalent of the new alkaloid, reckoned from the amount of acid contained in the salt, is 32.74. No alkaloid of opium, with the exception of pseudomorphia (which, moreover, shares many properties with the new alkaloid—*e.g.* its solubility in fixed alkalies, the blue colour produced by persalts of iron—it is however precipitated by ammonia, and indeed its composition has not yet been definitely settled), has so low an equivalent. But if the salt contain water, the equivalent of its base must necessarily be still less, and it may at least be regarded as certain, that amongst the alkaloids of opium, metamorphia possesses the lowest equivalent.

To obtain the pure base, the author first treated the hydrochlorate with sulphate of silver, to remove the hydrochloric acid. The solution was then digested with carbonate of barytes, and the filtrate, which contains only the pure base in solution, evaporated.

The base crystallizes from its alcoholic solution mostly in stellated groups of flatly compressed prisms, tolerably hard, and about $\frac{1}{15}$ of a line in thickness. At first they do not develop any taste, but, by longer keeping in the mouth, the author thought he remarked a very weak pungency, but quite destitute of bitterness.

Heated in a test tube over a spirit lamp, metamorphia fuses to a colourless liquid, which quickly becomes brown, then blackens, and strongly alkaline vapours are expelled. The alkaloid behaves somewhat differently if it be heated very gradually to determine its fusing point. Before the temperature has risen to 100° C., the crystals assume a dull appearance, and at a temperature of about 130° C., they become discoloured, acquiring a greyish brown appearance, which increases still more as the temperature is raised. At 225° C. they are blackish brown, do not show any symptoms of fusion, but still completely retain their original well-defined crystalline form. If the tube be now held directly over the flame of the spirit-lamp, they commence at once to fuse, and, of course, immediately acquire a dark brown colour.

Water takes up only an extremely small amount of the alkaloid, for 6000 parts of water at the ordinary temperature are required to dissolve one part by weight of it. This solution has no perceptible taste, and does not change either turmeric or reddened litmus paper. Seventy parts of boiling water are sufficient to dissolve one part of the alkaloid.

Alcohol of 90 p.c. Tralles, at the ordinary temperature, dissolves $\frac{1}{3}$ of the alkaloid. This solution possesses an intensely bitter taste, and a very slight alkaline reaction. Only nine times its weight of boiling alcohol is required for perfect solution.

It is almost insoluble in ether. One part by weight, left many days in contact with 6000 parts by weight of ether, did not show any perceptible diminution in bulk.

Solution of caustic potash immediately dissolves it. Solution of ammonia dissolves it more slowly. Solution of carbonate of potash and carbonate of ammonia have a solvent action upon it, not to any great extent in the cold, but better with the assistance of heat.

Concentrated sulphuric acid readily dissolves the alkaloid with a very faint and transitory tinge, the solution eventually assuming a very feeble brownish grey colour.

Nitric acid of sp. gr. 1.33 immediately colours the alkaloid orange red, and then quickly dissolves it, forming a yellow solution.

A concentrated solution of iodic acid, added to an aqueous solution of the alkaloid, produces gradually a yellow colour, and starch paper held over it is, by degrees, coloured violet.

Perchloride of iron causes no change in an aqueous solution of it.

Chloride of gold gradually produces, in an aqueous solution, a yellow cloudiness

(no blue colour as in aqueous solutions of morphia) which shortly increases, and a brown flocculent precipitate is finally produced.

Nitrate of silver produces in the aqueous solution of the alkaloid a greyish black cloudiness.—*Chemisches Central Blatt*, No. 61, p. 966, 12th Dec., 1860.

NOTE ON THE MANNA OF ALHAGI MAURORUM, D.C.

BY J. LÉON SOUBEIRAN.

We owe to the courtesy of Dr. Gaillardot, of Damascus, a very fine specimen of the manna of *Alhagi maurorum*, a great rarity in collections of Materia Medica, and which is frequently employed in the East for food, and as a purgative mixed with infusion of senna.

The *Alhagi maurorum*, D.C., is a thorny shrub belonging to the natural order Leguminosæ. The manna exudes upon the leaves and branches in the form of small semi-fluid drops, which become hardened by the action of the air. The inhabitants collect these exudations, and make them into loaves or cakes. These are of a greenish-yellow colour at first, but they soon become black, owing to a kind of fermentation produced by the influence of the air and moisture. Little care is bestowed upon the collection of the manna, and hence it is always mixed with a large proportion of broken leaves and branches, by which its value is diminished.

The odour of these manna loaves or cakes resembles that of senna ; in taste, also, they resemble senna, combined with sweetness. These two characters would lead us to suppose that this manna is more purgative than nutritive.

The manna should be collected, according to the statements of travellers, in the morning, as the rays of the sun cause its liquefaction. It is not produced indifferently in all localities, because its production only takes place under certain conditions of vegetation, which are only commonly met with in limited areas.

Some authors, as Hallé and Guillemin, supposed that this manna of the *Alhagi maurorum* was that which constituted the *manna of the Hebrews*; but, at the present day, it is more generally supposed that the *Lecanora affinis*, Everem, was the substance upon which the Israelites fed in the wilderness.*—*Gazette Médicale*, and *Repertoire de Pharmacie*, Paris.

MAMMOTH TREES.

The following extract of a paper by Mr. Murray, read to the members of the Edinburgh Botanical Society, cannot but be interesting to our readers :—

"The chief part of Mr. Murray's paper was occupied with an account of the Mammoth Tree (*Wellingtonia gigantea*), and of an expedition sent to procure seeds of it, by his brother, Mr. William Murray, of San Francisco. The first place where it was found was at a spot called the Calaveros Grove (more recently the Mammoth Tree Grove), near the head-waters of the Stanislaus and San Antonio rivers, in long. 120° 10′ W., and 38° N., and about 4590 feet above the sea-level. There the number of trees still standing amounts to 92.

"Two other localities are now known, one in Mariposa, and the other in Fresno county. The Mariposa Grove contains about 400 trees, and the Fresno Grove about 600. The tree is undoubtedly the largest and most magnificent known on the face of the earth. Its ally, the *Sequoia sempervirens*, is not far short of it in size, but still stands a little in the background. The average dimensions of both trees when full grown are about 300 feet in height, and ninety in circumference. We have great difficulty in realizing this immense height, and to assist us we must have recourse to other objects of comparison. To an Edinburgh man we have a very good one. The Gas Company's great chimney, although built in a hollow deep below Nelson's Monument, yet has its top seven feet higher. Now, it is only 329 feet high in all, including its pedestal, which is 65 feet in height; while one of these mammoth trees was actually 450 feet high, or nearly a third higher than that chimney, and Lord Richard Grosvenor, in a letter quoted in a recent number of the *Gardeners' Chronicle*, speaks of having seen one 116 feet in circumference, and 450 in height. It is taller

* See paper "On the Manna of the Hebrews," by M. O'Rorke, *Pharm. Journ.*, vol. ii., second series, page 169.

than St. Peter's, and little short of the height of the Pyramids. Another way of bringing home to our sensations an idea of the enormous size of these trees is that used by Messrs. Sang, nurserymen, Kirkcaldy, in a neat and comprehensive little account they have given of the tree. They calculate the quantity of wood in a tree, and its value at 1*d.* a foot. The result is, £6250 for a big one. What a nice little provision an acre of *Wellingtonia* would make for a younger son or daughter of the proprietor of an entailed estate! The trees seem all to rise like solid pillars, without a branch for nearly two-thirds of their height, often with furrowed bark, so as to look like fluted columns. Mr. Murray exhibited several photographs of the trees from Mariposa Grove, one of which was ninety-four feet in circumference. The tree is perfectly hardy in Britain, grows very rapidly, and, although only introduced in 1853, has already reached the height of 9½ feet, and 19 inches in circumference at base, at Castle Martyr, near Cork, and not much short of this both in England and Scotland, and has borne ripe fruit at Thetford in England. We may therefore reasonably hope that we shall ere long be independent of the sacred giants of the West for a sufficient supply of seed. In the mean time, we have the satisfaction of knowing that we can make plants by cuttings with the greatest facility; and what is most important in the great majority of cases, they grow erect and readily from leaders." —*Edinburgh Botanical Society.*

CASES OF ACCIDENTAL POISONING ABROAD.

1.—Poisoning by the Arum or Cuckoo-pint (*Arum maculatum* of Linnæus).

By M. Cangella.

A child, three years of age, having masticated on the 20th of April, 1860, at 2 p.m., some roots of the Arum, commonly called cuckoo-pint, complained immediately of burning pains in the mouth and lips. Three hours afterwards, it was in a state of profound torpor, to which succeeded a violent febrile reaction. At eight o'clock, I found the little patient in a prostrate condition, unable to speak, raising its hands frequently to its mouth and throat, and uttering at intervals a sharp cry, and starting up as if suffocated. I observed that the caustic action of the plant had extended to the lips, the palate, the tongue, the tonsils, the pharynx, and wherever I could see; the pain of the stomach, on pressing it, indicated to me that the child had swallowed the juice, and that its caustic action had extended thus far.

Not having any means at hand to produce the evacuation of the poisonous matter, I administered a solution of common salt; but deglutition was impossible; the swelling was such, that I could not even introduce a probang into the œsophagus. The most energetic revulsive agents were employed without success, and death took place at eleven o'clock, during delirium, from asphyxia.—*Gazetta Medica do Porto*, and *Repertoire de Pharmacie*, Paris.

2.—Euphorbia Lathyris as a Poison.

Three workmen of Toulouse, engaged in the tobacco manufacture, conceived and carried out lately the singular notion of purging themselves immediately after their breakfast. They selected for this purpose the seeds of *Euphorbia Lathyris*, which are very much used as a purgative agent amongst the peasants of our country. One workman took eighteen seeds, and the other two, twenty and twenty-five respectively.

A short time after the ingestion of the seeds, they produced violent purgation, vomiting, frequent diarrhœa, and a general pallidness and coldness spread over the body. These symptoms, which strikingly resembled those produced by an attack of sporadic cholera, yielded to appropriate treatment, and in the evening of the same day the three imprudent workmen had entirely recovered.

This case confirms what has already been experimentally proved by Dr. Augustus Dassier, namely, that the seeds of certain Euphorbiaceous plants, as those of *Ricinus communis*, when swallowed whole, exert a far more violent action than that of the oil extracted from the same seeds.

According to Soubeiran, the seeds of the *Euphorbia Lathyris* contain an acrid matter, which is only partly soluble in the yellow-fixed oil which they also contain. Hence, we have another fact which serves to corroborate and explain the difference before noticed in the mode of action of the oil and the entire seeds.

3.—Poisonous Effects of Euphorbia Peplus.

The following case, recently communicated to the Academy of Sciences by Dr. D. Bernard, will also illustrate the disastrous effects which may result from the empiric employment of the indigenous Euphorbiaceous plants:—

A lady, following the advice of an old woman, cut some stems of *Euphorbia Peplus*, and applied the milky juice flowing from them to her already swollen gums. Instantly her mouth became so much inflamed, that the doctor, when he saw his patient, thought that the inflammation was due to the action of mercurial medicines.

For several days the pain was intolerable, and wrung cries from the patient, who, deprived of sleep and unable to drink, was a prey to indescribable agitation.

By the aid of lotions, combined with emollient and opiate injections, and by the employment of revulsives and laudanumized poultices, and assisted especially by time, the action of the caustic became weaker, the inflammation gradually diminished and at the end of eight days the cure was nearly complete.

4.—Poisoning by the Berries of Solanum Dulcamara.

Whilst we are upon poisonous agents, we may notice a fatal case of poisoning which occurred lately near Toulouse. It happened to a child who had swallowed some berries of *Solanum Dulcamara*, and who, notwithstanding the greatest care which was given to it, died the same day.

This fact is important, as some authors—amongst others, M. Guibourt—have proved that the plants of the genus Solanum, and especially the berries of *Solanum Dulcamara*, possess far less poisonous properties than those of the genera Datura and Atropa, which belong to the same natural order.—*Journal de Médecine de Toulouse*, and *Repertoire de Pharmacie*, Paris.

ALLEGED POISONING BY A "MEDICAL BOTANIST."

An inquest has been held before Mr. T. C. Maynard, at the Prospect Hotel, Sunderland, on the body of a woman named Margaret Fletcher, aged thirty-three, residing in Sailors' Alley, who had died under circumstances which led to the suspicion that she had been poisoned by some medicine administered by a quack doctor named David Bellhouse. As will be seen from the evidence, the woman's death was clearly traceable to another cause, and therefore the only point of interest in the inquest was the examination of the doctor himself.

Bellhouse, in answer to questions put by the coroner, said: I am a medical botanist. I prepare medicines, and administer them to parties who apply to me. I do not gather the herbs I use myself, but purchase them from people who bring them to me. I cannot always distinguish between the leaves of plants, because they are brought to me dried, and frequently broken to pieces. I could not distinguish between the dried broken leaves of monkshood and the dried leaves of mint, excepting by smell. Sarsaparilla is sometimes bitter sweet. The branches are used medicinally, and it looks like sticks chopped up. It is generally sold as a root, and represented to be so, but things are not what they seem to be, and I always considered them to be the branches. I think, sir, you are leading me to blunder.

The Coroner: No, sir. I want to get the truth from you, as you have no right to represent yourself to the public as a medical botanist, when, according to your own confession, you are unable to distinguish the leaves of one plant from those of another. If you are a medical botanist, you ought to be able to distinguish them if they are even reduced to powder.

Examination continued: The bottle produced is the one I gave to the deceased. The label upon it represents it to be "concentrated decoction of red Jamaica sarsaparilla." I never saw any but one kind of sarsaparilla. As to specifying it as "red," I bought the labels ready printed. That bottle does not contain one particle of sarsaparilla. It contains iodide of potassium, but in what proportion I cannot swear, as I did not weigh it. I just make it up, when wanted, by guess. I understand iodide of potassium is made from kelp, but I don't know whether it can be made from anything else or not. When administered it will make the nose run, but it won't make a sore leg run away. (Laughter.) I think it was good for ulcers,

such as those of the deceased; but I don't know the why and the wherefore. I have generally found that it makes the ulcer run.

The evidence of the surgeon who had made a *post mortem* examination of the body, and other witnesses, clearly indicating that the deceased had died from disease of the heart, the jury returned a verdict to that effect, and the "Medical Botanist" was discharged.

MISCELLANEA.

Exports from Zanzibar.—In the year 1859, there were exported from Zanzibar, 875,875 lbs of copal, value £37,166, and 4,860,100 lbs of cloves, value £55,666.

The whole island of Zanzibar is of exceeding fertility, and sugar cane, cotton, cloves, nutmegs, pepper, coffee, rice, sorghum, &c., grow in the greatest perfection. —Letter of Mr. Consul Rigby, in *Times*, Jan., 1861.

Rock Oil.—The following paragraph appeared in the circular of Messrs. Joseph Travers and Sons:—

"A new product is in course of development in the State of New York, which promises to have an extraordinary influence in expanding the oil trade. In the western part of the State, at a place called Union Mills, a tract of land has been discovered, which, at depths varying from a few feet to 500 feet from the surface, abounds in liquid matter, of which one-third is oil capable of being used as one of the best illuminating agents, and also, when mixed with a certain proportion of fish oil, of being applied for the purposes of lubrication, and other manufacturing processes. Already the product is found to extend over 100 square miles, and the people in the district are sanguine that the supply will hold out. This, of course, is the grand question. At present the oil is being despatched to New York at the rate of 1500 barrels per day, and the demand for it at that port is practically unlimited. The distance of Union Mills from New York is about 400 miles, but the country is traversed by the Atlantic and Great Western and the Erie Railways, both of which lines are calculating on great revenues from the business, and the cost and mode of transportation are therefore easy."

The following additional particulars are given by Mr. Horace Wilkins, of Cleveland, Ohio, in a letter to the *Times*, of January 21st. Mr. Wilkins also alludes to a similar product mentioned by Sir Charles Lyell, in his *Principles of Geology*, pp. 248 and 250, as found in the Burman Empire, near the city of Ava, and wishes to know something of the character and uses of this Burman oil:—

"In November, 1859, in the State of Pennsylvania, wells were sunk for the purpose of pumping petroleum, or rock oil, and it has been vigorously continued up to this time, many of the wells producing from 10 to 50 barrels of oil a day, and some even more.

"In July, 1860, in the State of Ohio, 50 miles from Cleveland, oil was discovered, and in the short time elapsed more than 50 wells have been put in successful operation, yielding from 10 to 60 barrels, and at this time hundreds of wells are being put down.

"This oil is being refined for illuminating purposes, for which it is excellent, surpassing in brilliancy the best sperm oil, or any other article for light known on this continent, at the same time being half the price of sperm.

"The oil, in a crude state, is an excellent lubricator, and is used on many of the railroads, as well as in other departments requiring a friction oil."

Coal-tar Soap.—M. Demeaux recommends this soap as a disinfectant. It is made by mixing equal parts of coal-tar, soap, and rectified spirit, heated on a water-bath to complete solution. On cooling, a soap is obtained which is perfectly soluble in warm or cold water. The Academy of Sciences of Paris have appointed a committee to report on the above.

The Practice of Medicine and Pharmacy in Prussia.—The medical staff of Prussia, according to the last survey, with a population of 17,739,913 inhabitants, amounts to 358 district physicians (these are paid by the Government, and have to attend the poor gratis), 4327 physicians who have the doctor's degree, 996 surgeons

of the first class, 643 of the second class, 1026 doctors for animals, first and second class, 1529 chemists, and 11,411 midwives.

On a New Form of Iodide of Potassium.—It is stated by Bernard Piffard (*Chemical News*) that although iodide of potassium, when pure, will endure a high temperature without undergoing decomposition, he found when intimately mixed with about equal parts of either magnesia, silicic acid, baryta, or fused boracic acid, and raised to a red heat in a crucible, copious fumes of iodidine are given off, and that if the contents of the crucible be afterwards dissolved in water and filtered (which is easy in the case of the magnesia or silicic acid), the liquid will contain an iodide of potassium, having properties different from that of the ordinary iodide. The heat should be continued as long as any scent of iodidine is given off, otherwise the decomposition will not be complete. It differs chiefly from the ordinary iodide in the amount of precipitate produced by acetate of lead, being less owing to the small quantity of iodidine it contains, and also in its being less easily crystallised. Bromide of potassium appears to undergo a similar decomposition under similar circumstances.

The Purification of Cod-Liver Oil.—M. Jeannel gives the following as the result of various experiments in the removal of the disagreeable odour and taste of cod-liver oil:—1. That the essential oil of bitter almonds, in the proportion of $7\frac{1}{2}$ grains to 25 drachms of even the most infected oil, is completely successful. 2. One grain of anhydrous hydrocyanic acid dissolved in water, will disinfect, but does not perfume the same amount of oil. 3. Distilled laurel water, in the proportion of once or twice the volume of the oil, is, however, the best means of effecting the result; the mixture is agitated in a bottle, and the liquids are then separated by a funnel after 48 hours' rest; and the oil, if necessary, filtered through paper. M. Jeannel states that the above process does not remove rancidity, which is different from the fishy odour and taste.

White Lilacs.—We see by a communication of M. Duchartre to the Botanical Society of Paris that there is a great demand for white lilacs for ladies' bouquets in Paris in winter, and that as the common white lilac will not force well, and the flowers turn yellow, M. Laurent aîné meets the demand by causing the purple Lilas de Marly to expand in perfect darkness at a high temperature. This variety forces very well, and thus treated produces flowers of a pure white, which do not acquire any colour if gathered as soon as brought into the light. The leaves are apt to turn yellow, however, which is not the case with the Lilas Charles Dix, which equally can be made to whiten, but with bunches of flowers not so fine as the Lilas de Marly. The Persian Lilac will not whiten. These statements are not only extremely curious, but quite unexpected. Why the absence of light should produce effects so dissimilar upon plants so similar as lilacs, is a question for vegetable chemistry to explain. It should be verified and extended in all directions by those who have to provide winter decoration by expensive means; for it is probable that the peculiarities thus said to exist among one race of plants will be equally characteristic of others.—*Gardeners' Chronicle.*

Suspected Case of Poisoning.—A case of this nature has occurred at Diss, Norfolk. Albert, the youngest son of Mr. R. Aldrich, of that town, was taken suddenly ill, and died in a few hours, after suffering painful convulsions. Two other members of Mr. Aldrich's family were attacked in a similar manner, but recovered. The symptoms of the deceased were those of bilious diarrhœa, and he was found by the surgeon to be in a semi-comatose condition. The surgeon gave him a powder, and called again in an hour or two, when he found that another medical man had been summoned to the bedside of the sufferer, and that the symptoms were still more alarming, the child being convulsed, the pupils of the eyes very much dilated, and the thumbs curiously turned in. The poor boy died in the course of 24 hours after he was first attacked. A *post-mortem* examination was made of his body, which presented a perfectly healthy appearance, with the exception of a perforation in the stomach about the size of a shilling—such as might have been caused by the action of a strong corrosive poison. The stomach did not present the appearance generally caused by the administration of arsenic or corrosive sublimate; but the

examining surgeon was of opinion that the death of the boy was occasioned by the presence of poison in his system, although he could not indicate precisely what that poison was. On these facts being stated at an inquest held by Mr. E. S. Bignold, deputy-coroner for Norfolk, the jury requested that an adjournment might take place, in order that the stomach might undergo a proper analysis. This the deputy-coroner said he should not feel it his duty to order. The jury then inquired the law on the subject, and, finding that the coroner had the option of acting as he pleased in the matter, they requested that a copy of the depositions should be forwarded to the Home Secretary. This course being also objected to by the deputy-coroner, the jury unanimously declined to return a verdict. The inquiry was eventually adjourned to enable the deputy-coroner to consult the coroner for the county upon the course to be pursued.

Case of Supposed Death from Chloroform.—A strong man, forty years of age, living near Bordeaux, crushed his leg by a fall from a horse, syncope coming on at the time of the accident. Six or eight hours afterwards, when amputation was about to be performed, he was in a condition of excessive mental disturbance and extreme alarm, and forbade its performance unless previously put to sleep. The surgeons not desiring to employ chloroform in such a condition of prostration, resolved merely to pretend to do so in order to satisfy the patient. Scarcely, however, had he made four inspirations of a diluted chloroform, held a long distance from his mouth and nostrils, than the respiration and circulation became suddenly arrested, and so remained in spite of all means employed. How far the chloroform was really concerned in the production of this catastrophe we must leave to our readers to judge.—*Medical Times and Gazette.*

Suicide by Essential Oil of Almonds.—An inquest has been held at Mile End Old Town, before Mr. Humphreys, on the body of Matilda Mary Child, aged thirty-two, who committed suicide by swallowing a large quantity of essential oil of almonds. It appeared that the deceased had an illegitimate child, and had been deserted by the father. She had consequently been reduced to a very destitute condition, and had earned a scanty subsistence by shirt making. The deceased was found lying in bed, a tumbler and two letters by her side. A surgeon was sent for, but death had taken place some hours. The jury returned a verdict of "Temporary insanity."

OBITUARY.

DEATH OF THOMAS SOUTHALL, ESQ., OF BIRMINGHAM.

We regret to announce the death of Mr. Thomas Southall, which took place on Saturday, the 12th of January, at Edgbaston, Birmingham. Mr. Southall had been engaged in the practice of pharmacy for more than forty years, and had acquired a high reputation as a conscientious and accomplished Pharmaceutist. From the first establishment of the Pharmaceutical Society he became a zealous and influential promoter of its objects, and was for many years a member of its Council. He has also been a frequent and valued contributer to this Journal. Mr. Southall died, after a few days' illness, of inflammation of the lungs.

DEATH OF DR. KLOTZSCH.

Professor Johann Frederick Klotzsch, Doctor of Philosophy and Medicine, died at Berlin on the 5th of November, 1860, aged 55 years. Dr. Klotzsch commenced life in the occupation of assistant to an apothecary; and diligently pursuing the study of natural history, especially botany, he became curator of the herbarium of Sir William J. Hooker, and subsequently held the same office in the Royal Herbarium at Berlin. Dr. Klotzsch was a careful and laborious observer, and the author of many papers on botanical and pharmacological subjects.

BOOKS RECEIVED.

THE MEDICAL VOCABULARY; *containing a concise Explanation of the Terms used in Medicine and its Accessory Sciences.* By ROBERT FOWLER, M.D. Edin., &c. London: Henry Renshaw, 356, Strand. 1860.

THIS little volume may be consulted with advantage by Medical and Pharmaceutical Students, who desire to know the meaning of the technical terms which they meet with in the course of their studies. We are glad to find that the derivations of the different terms are appended to the definitions.

REVISTA FARMACEUTICA. Publicada por la Asociacion Farmaceutica de Buenos Aires. (For October, 1860.)

LONDON MEDICAL PRACTICE: *Its Sins and Shortcomings.* By a Physician. London: Simpkin, Marshall, and Co. 1860.

THE HALF-YEARLY ABSTRACT OF THE MEDICAL SCIENCES. Edited by W. H. RANKIN, M.D., &c., and C. B. RADCLIFFE, M.D., &c. July—December, 1860. London: John Churchill, New Burlington Street. 1861.

TO CORRESPONDENTS.

G. M. H. (Plymouth).—(1.) When "Liquor Taraxaci" is ordered, that prepared by the addition of spirit to the fresh juice is intended. (2.) "Wodanium" is a species of pyrites found in Hungary. (3.) *Tinctura Actææ* (*Cimicifuga racemosa*). The medicinal property of the black snake root is considered to be tonic. It has been administered with success by Dr. Simpson, of Edinburgh (*Medical Gazette*, Dec. 8, 1860), in rheumatic affections, and with marked success in a case of mental depression. In the absence of any recognized formula for preparing the tincture, we give the following, the dose of which is from ʒss. to ʒij. :—

Black snake root, 2 ounces
Proof spirit, 2 pints

Macerate for seven days, then press and strain; or proceed by percolation. (4.) Apply by letter to the Secretary, 17, Bloomsbury Square.

W. B.—The subject is quite out of our province; we should recommend the advice of a medical practitioner.

J. C. (Hereford).—*Sheep Poisoning by Arsenic.* Vol. xviii., pp. 511, 524, and 554.

A Registered Apprentice (Bradford).—(1.) Carbonate of soda may be deprived of its carbonic acid by adding hydrate of lime to a dilute solution of the carbonate. See any work on chemistry. (2.) Associates of the Pharmaceutical Society are eligible for the office of Dispensers of Medicine in the army. (3.) The particulars required will be furnished on application by letter to the Secretary, 17, Bloomsbury Square. (4.) No.

Veritas.—We hope to be enabled to publish a detailed description of the Examinations in the next number, which will supply answers to all the questions.

M. P. S. (Chelsea).—We quite agree with the suggestion.

A Member (London) is thanked for his communication. We do not think it would be wise, especially at the present time, to discuss the first question referred to. The other question is deserving attention, and, we believe, is not lost sight of.

NOTICE.—The back numbers of the *Pharmaceutical Journal* may now be obtained from Mr. Churchill, 11, New Burlington Street; Members and Associates will be supplied on application to the Secretary, 17, Bloomsbury Square.

ERRATUM.—Page 369, line 10, *for* "water," *read* "wine."

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, ELIAS BREMRIDGE, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. CHURCHILL, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.

SECOND SERIES.

VOL. II.—No. IX.—MARCH 1st, 1861.

THE EXAMINATIONS OF THE PHARMACEUTICAL SOCIETY.

In a previous number of this Journal (January, 1861, page 345), allusion is made to the arrangements for conducting the examinations of the Pharmaceutical Society, a detailed description of which we promised to give for the guidance of students. We are now enabled to lay before our readers the following official statement of the existing regulations of the Board of Examiners:—

The Board of Examiners in London.

The regular days of meeting for conducting the examinations are the third Tuesday in every month throughout the year, excepting May and September, at 11 A.M.

The Board of Examiners in Edinburgh.

The Board meets at such times as suit the amount of business to be transacted. Notice is given in the *Pharmaceutical Journal* when such meetings are to take place.

Classical or Preliminary Examination.

Candidates for registration as Apprentices or Students in Pharmacy are examined in the following subjects:—

Latin—translation of a passage from the first book of Cæsar's Commentaries, *De Bello Gallico.*
Latin Grammar.
English Grammar and Composition.
The first four rules of arithmetic, simple and compound; vulgar fractions, and decimals.

No candidate shall be admitted to this examination until he has completed his fifteenth year, and shall have given to the Secretary a notice of his intention to present himself for examination, together with a certificate of age and the fee of two guineas, one week prior to the day of examination. If the candidate fail to pass the examination the fee shall not be returned to him, but he shall be admitted, on giving the required notice, to any subsequent examination without further payment.*

* The Middle Class Examination of Oxford, Cambridge, or Durham, and the Examination of the College of Preceptors, including Latin as one of the subjects, are accepted on behalf of Registered Apprentices or Students in Pharmacy, in lieu of the examination by the Board of Examiners in Bloomsbury Square.

Candidates residing at a distance of more than ten miles from London (or, if in Scotland, at that distance from Edinburgh) may, on applying to the Secretary, and enclosing the specified fee and certificate of age, be supplied with a printed form of certificate, to enable them to be examined by any qualified person approved by the Board, *but not being the teacher of the candidate.*

The certificate of examination, duly signed by the Examiner, and delivered to the Secretary, will, if approved by the Board, entitle the candidate to be placed on the register, and admitted to the privileges of the Society during the period of apprenticeship.

The Minor Examination.

Candidates are examined in the following subjects :—

Prescriptions.—The candidate is required to read without abbreviation autograph prescriptions ; to translate them into English ; and to render a literal as well as an appropriate translation of the directions for use.

Botany.—To recognise the medicinal plants of the Pharmacopœia; and to possess a knowledge of the elementary structure of plants, and of the general characters and structure of root, stem, and leaf.

Materia Medica.—To recognise the several specimens of roots, barks, leaves, fruits, resins, gums, &c., contained in the Materia Medica of the Pharmacopœia, to give the botanical names of the plants yielding them, the natural orders to which they belong, the countries from which they are obtained, and the officinal preparations into which they enter ; also, to recognise and describe the sources of the more important animal substances used in medicine.

Pharmacy.—To recognise the several preparations of the Pharmacopœia which are not of a definite chemical nature, such as extracts, tinctures, the simple and the compound powders, &c.; to describe the composition of such as are compound, and to give the proportions of the active ingredients.

Chemistry.—To recognise the several acids, oxides, salts, and other definite chemical bodies ordered in the Pharmacopœia; to describe the processes by which they are produced, the composition of such as are compound, and the decompositions that occur in their production.

Practical Dispensing.—To weigh, measure, and compound medicines in the most approved manner, to write the directions in concise language as well as in a *neat and distinct* hand, and correctly translate the prescription; finally, to finish and properly direct each package. The candidate will be required to spread plasters with dexterity and neatness.

No candidate shall be admitted to this examination until he has completed the nineteenth year of his age, and has passed the preliminary examination, or complied with the provision stated below.* He must give to the Secretary a notice of his intention to present himself for examination, together with a certificate of age and the fee,† one week prior to the day of examination. If the candidate fail to pass the examination, the fee shall not be returned to him, but he shall be admitted to a subsequent examination, without further payment, after not less than two months, on giving the required notice.

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* Candidates who have not passed the preliminary examination, may pass it at the same time as the Minor Examination, upon giving previous notice to the Secretary.

† Three guineas for a registered Apprentice, and five guineas for a candidate not previously registered.

The Major Examination.

Prescriptions and Posology.—The candidate is required to render in good Latin, prescriptions written in English; to detect errors in written Latin prescriptions, and to discover the occurrence of unusually large doses when such are prescribed.

Botany.—The examination in Structural Botany will be confined to the Organs of Reproduction, if sufficient knowledge of the Organs of Nutrition has been exhibited at the Minor Examination. The candidate will be also required to possess an elementary knowledge of the Functions of Plants. Systematic Botany (comprising an acquaintance with the General Principles of Classification, and the essential characters or diagnoses of the natural orders mentioned in the annexed schedule) will also form an important part of this examination.

Materia Medica.—The examination will extend to the qualities of Drugs, the means of estimating these qualities, and of distinguishing the genuine from the spurious. It will comprise a knowledge of the active proximate constituents of the most important drugs, and of the methods of obtaining these in a separate state and testing their purity.

Pharmacy.—The candidate is required to explain the processes employed for the preparation of medicines which have not a definite chemical composition, including maceration, percolation, evaporation, &c., and to manifest an acquaintance with published improved processes for pharmaceutical preparations.

Chemistry.—The examination will comprehend the laws of chemical combination, the means of determining, by tests, the composition of chemical substances used in medicine, and especially of detecting impurities; also the means of detecting poisons, and the best antidotes for poisons, to be administered in cases of emergency. In this part of the examination will also be comprehended chemical physics, as far as this branch of knowledge is treated of in Fownes's *Manual of Chemistry.*

Practical Dispensing.—If sufficient dexterity has been manifested in ordinary dispensing operations at the Minor Examination, the candidate will not be required to repeat them. He will be examined with reference to his knowledge of the strength of simple solutions ordered in the Pharmacopœia, by which he may be enabled readily to make practical application of such knowledge; also with reference to the best excipients and methods of manipulation, for forming emulsions with oils, resins, balsams, and other substances not otherwise miscible with aqueous liquids, and for giving a good pilular condition to substances which are administered in that form.

No candidate shall be admitted to this examination until he has completed the twenty-first year of his age, and has passed the Minor Examination at least three months previously, excepting that, with reference to the last-named condition, the Board may depart from the rule under special circumstances which appear to them to justify such a departure. The candidate must give to the Secretary a notice of his intention to present himself for examination, together with a certificate of age, and the fee of five guineas, one week prior to the day of examination. If the candidate fail to pass the examination, the fee will not be returned to him, but he will be admitted to a subsequent examination without further payment, after not less than three months, on giving the required notice.

Candidates who, in the opinion of the Board of Examiners, have passed an examination which entitles them to be placed in the first division, will be admitted to compete for honours to be decided upon by the Council.

SCHEDULE OF NATURAL ORDERS AND GENERA OF PLANTS

Referred to in the Major Botanical Examination in the foregoing Regulations.

SYSTEMATIC BOTANY.

Diagnoses of the following Natural Orders:—

CLASS I.

EXOGENÆ v. DICOTYLEDONES.

Sub-class 1.—Thalamifloræ.

*Ranunculaceæ. Aconitum — Delphinium—Helleborus.
*Papaveraceæ. Papaver—Chelidonium.
Cruciferæ. Brassica—Cheiranthus—Sinapis.
Polygalaceæ. Polygala.
Caryophyllaceæ. Dianthus.
Linaceæ. Linum.
*Malvaceæ. Malva—Althæa.
*Geraniaceæ. Geranium—Pelargonium.
Hypericaceæ. Hypericum.
Rutaceæ. Ruta.

Sub-class 2.—Calycifloræ.

*Leguminosæ or Fabaceæ. Cytisus—Ulex—Trifolium—Vicia.
*Rosaceæ. Potentilla—Rubus—Rosa—Pyrus.
*Cucurbitaceæ. Bryonia—Cucumis.
*Umbelliferæ or Apiaceæ. Daucus—Pastinaca — Apium — Fœniculum — Petroselinum — Anethum — Pimpinella — Coriandrum — Conium — Æthusa.

Sub-class 3.—Corollifloræ.

Caprifoliaceæ. Sambucus—Viburnum.
Rubiaceæ. Rubia—Galium.
Valerianaceæ. Valeriana — Centranthus.
*Compositæ or Asteraceæ. Pyrethrum—Anthemis—Cnicus—Tussilago Artemisia — Leontodon — Cichorium —Lactuca.
*Gentianaceæ. Gentiana — Erythræa —Menyanthes.
*Solanaceæ. Solanum.
*Atropaceæ. Datura—Hyoscyamus—Atropa.
*Scrophulariaceæ. Digitalis.
*Boraginaceæ. Symphytum—Borago.
*Labiatæ. Mentha—Salvia—Lavandula—Marrubium.
Oleaceæ. Fraxinus—Ligustrum.
Primulaceæ. Primula—Anagallis.
*Convolvulaceæ. Convolvulus.

Sub-class 4.—Monochlamydeæ.

*Polygonaceæ. Polygonum—Rumex.
*Euphorbiaceæ. Euphorbia — Mercurialis.
Aristolochiaceæ. Aristolochia.
Cupuliferæ. Corylus—Quercus.
Coniferæ. Pinus—Juniperus.

CLASS II.

ENDOGENÆ v. MONOCOTYLEDONES.

Sub-class 1.—Dictyogenæ.

Dioscoreaceæ. Tamus.

Sub-class 2.—Petaloideæ.

Orchidaceæ. Orchis.
*Iridaceæ. Iris—Crocus.
Amaryllidaceæ. Narcissus.
*Liliaceæ. Allium—Scilla.
*Melanthaceæ. Colchicum.
Acoraceæ. Acorus.
Araceæ. Arum.

Sub-class 3.—Glumaceæ.

*Graminaceæ. Secale — Triticum — Hordeum—Avena.

CLASS III.

CRYPTOGAMIA v. ACOTYLEDONES.

Sub-class 1.—Acrogenæ.

*Filices. Aspidium—Pteris.

Note.—The candidate will be required to describe the essential characters of the Natural Orders marked above with an asterisk; and to have a general idea of the other Natural Orders, so as to be able to refer any plant contained in them to its proper Order. He will also be expected to recognise the Genera.

TRANSACTIONS

OF

THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, 6*th February*, 1861,

Present—Messrs. Bird, Bottle, Bucklee, Davenport, Deane, Edwards, Evans, Hanbury, Haselden, Herring, Hills, Lescher, Meggeson, Morson, Sandford, Squire, Standring, and Waugh, the following were elected

MEMBERS.

Deptford.....Adkins, Ernest
Kirkwall.....Iverach, John Guthrie

ELECTION OF THE COUNCIL.

The following Members of the Council were drawn by Lot to remain in office for the ensuing year:—

Bottle, Alexander, 37, Townwall Street, Dover
Davenport, John T., 33, Great Russell Street, Bloomsbury
Deane, Henry, Clapham
Evans, Henry Sugden, Liverpool
Hills, Thomas Hyde, 338, Oxford Street
Standring, Thomas, 1, Piccadilly, Manchester
Waugh, George, 177, Regent Street

MAJOR EXAMINATION, 19*th February.*

Briggs, James Aston.....Tipton
Brown, William Henry .....North Shields
Colby, John .....Brighton
Gething, William Burford .....Lincoln
Meadows, Henry .....Gloucester
Savage, William Wallace .....Brighton

MINOR EXAMINATION.

Bell, William .....Bedford
Blane, Gilbert .....Mauritius
Duffin, Thomas .....Wakefield
Fuller, Ira Thomas .....Beccles
Sturton, John R. .....Peterborough
Watt, John Newton.....London

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS.
Diaper, Albert	Mr. Banfield	Bury St. Edmunds
Greatrex, Thomas James	Mr. Andrews	London
Oldfield, Francis	Mr. Bolton	Dover
Woodcock, James	Mr. Cutting	Leamington

PHARMACEUTICAL MEETING.

Wednesday, February 6th, 1861.

MR. T. N. R. MORSON, PRESIDENT, IN THE CHAIR.

DONATIONS TO THE LIBRARY AND MUSEUM

were announced as follows:—

The Proceedings of the American Pharmaceutical Society, for 1860. From the Editor.

The Journal of the Society of Arts. From the Society.

The Photographic Journal. From the Society.

The Transactions of the Linnean Society. From the Society.

The Chemist and Druggist. From the Editor.

The Chemical News. From the Editor.

The British Journal of Dental Science. From the Publisher.

The American Journal of Pharmacy, January. From the Editor.

The Journal of the Pharmaceutical Society of Victoria. From the Editor.

Some very fine specimens of Flaky Tragacanth. From Mr. Maltass, through Mr. Strafford, of Liverpool.

Specimen of Astragalus gummifer in flower, and with Tragacanth concreted on the surface of the stem, from Syria. From Mr. Hanbury.

Specimen of an Oil from India, called Kiaputy Indian Oil, with the vessel in which it was contained. From Mr. Marris.

Mr. D. Hanbury exhibited to the meeting a specimen of *Anacahuite Wood.*

The following Papers were read:—

NOTE ON THE USE OF *BALSAM OF PERU* IN THE ROMAN CATHOLIC CHURCH.

BY DANIEL HANBURY, F.L.S.

In an interesting notice respecting the liquid commonly, though incorrectly, called *Balsam of Peru*, given some months ago in the *American Journal of Pharmacy*, the writer, Dr. Charles Dorat, pointed out the curious fact that the balsam was at one time in such great esteem, that its employment was sanctioned by high ecclesiastical authority in the preparation of the Chrism used in the Roman Catholic Church. It appears, moreover, that there still exist among the archives of Guatemala, copies of bulls of Popes Pius IV. and Pius V., authorizing the clergy to make use of this balsam in the Holy Chrism, and pronouncing it sacrilege to destroy or injure the trees producing it.

Thinking it would be interesting to ascertain with precision the terms of these ancient documents, I asked my friend, Signor Vincenzo Sanguinetti, Professor of Mineralogy at Rome, to make application in the proper quarter, and to obtain for me, if possible, copies of the bulls in question. Professor Sanguinetti was kind enough promptly to respond to my request, but he found that the records of bulls issued during the pontificate of Pius IV. have been lost, and that none can now be discovered in the archives of the Vatican. His search for the bull of Pius V. was, however, successful, and he forwarded me a copy, which, with a translation, I have given below. It will be observed that the bull allows the substitution of *Balsam of Peru* for *Mecca Balsam*, which latter, mixed with oil, constitutes the ordinary *Chrisma principale* of the Roman Catholic Church.*

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* Vide Dr. Hook's *Church Dictionary*, Ed. 6, Lond., 1852, where *Chrism* is thus defined:

"*Chrism*—Oil consecrated in the Romish and Greek churches by the bishop, and used in baptism, confirmation, orders, and extreme unction. This chrism is consecrated with great ceremony upon Holy Thursday. There are two sorts of it; the one is a composition of oil and balsam, made use of in baptism, confirmation, and orders; the other is only plain oil consecrated by the bishop, and used for catechumens and extreme unction. Chrism has been discontinued in the Church of England since the Reformation."

Consult also Hoffmann, *Lexicon Universale*, Lugd. Bat., 1698 (in verbum).

FACULTAS EPISCOPIS INDIARUM.
In confectione Sacri Chrismatis certo liquore seu succo in locum Balsami.

PIUS PAPA QUINTUS,
ad perpetuam rei memoriam.

Digna reddimur attentione solliciti illa ad exauditionis gratiam admittere vota, per quæ in necessitatibus in sacramentorum confectione occurrit, et consuli possit.

§. 1. Expositum siquidem Nobis nuper fuit, quod in partibus Indiarum ubi antistites commorantur, non invenitur nec inveniri potest balsamus vel oleum ex balsamo ad conficiendum S. Chrisma necessarium; reperitur autem quidam liquor, seu succus, mira odoris fragrantia, et ad lavanda vulnera ad modum conducens, qui communiter habetur pro vero balsamo, præstat enim effectus quos balsamum ab Alexandria allatum præstitisse perhibetur.

§. 2. Quare iidem partium Indiarum præsules Nobis humiliter supplicari fecerunt, ut in præmissis de aliquo opportuno remedio providere de benignitate apostolica dignaremur.

§. 3. Nos igitur necessitatibus hujusmodi consulere volentes, hujusmodi supplicationibus inclinati, tam Archiepiscopis quam Episcopis illarum partium, et pro tempore in ipsis partibus commoraturis antistitibus, ut de cetero perpetuis futuris temporibus in confectione S. Chrismatis dicto liquore seu succo in locum balsami, uti libere et licite possint, amplam licentiam et facultatem, apostolica auctoritate tenore præsentium concedimus, et desuper indulgemus ac dicto Sancto Chrismati cum dicto succo rite tamen confecto, tantam fidem adhibendam esse, ac si in illo balsamus intervenisset.

§. 4. Non obstantibus præmissis quibusvis apostolicis ac in Provincialibus et Synodalibus Conciliis editis generalibus vel specialibus constitutionibus et ordinationibus cæterisque contrariis quibuscumque.

Datum Romæ apud S. Petrum sub annulo Piscatoris die 2. Augusti 1571, Pontificatus nostri anno VI.

Translation.

A Faculty granted to the Bishops of the Indies, for the preparation of the Holy Chrism with a certain liquor or juice in the place of Balsam.

Pius V., Pope, for the perpetual commemoration of this matter.

We are rendered most anxious to admit to the favour of a careful hearing, these prayers, worthy of attention, by which a necessity occurs in the preparation of sacred things, and how the same may be provided for.

1. Forasmuch as it hath lately been explained to us, that in those parts of the Indies where our prelates sojourn, there is not found, nor can be found, the Balsam-tree or oil therefrom, necessary for the preparation of the Holy Chrism; but there is found a certain liquor or juice, of wonderfully fragrant odour and exceedingly efficacious for the cleansing of wounds, which liquor is commonly used instead of the true Balsam, for it produces all the effects which the Balsam brought from Alexandria is accounted to have produced.

2. Wherefore these same prelates of the parts of the Indies have caused us to be humbly supplicated, that under these premises we would, of our apostolic bounty, vouchsafe to provide some convenient remedy.

3. We, therefore, willing to provide against necessities of this kind, and moved by these prayers, do, of our apostolic authority, concede by the tenor of these presents, full licence and permission, as well to the archbishops as to the bishops of those parts, and, for the time being, to those prelates who may in future

sojourn in those parts, that they may, in the preparation of the Holy Chrism freely and lawfully use the said liquor or juice in the place of balsam. And by a further indulgence we decree that the same efficacy shall be attributed to the said Holy Chrism if prepared aright with the said juice, as if balsam were an ingredient in it.

4. Any previous constitutions or ordinances whatever, whether apostolic, or given forth by provincial and synodal councils, whether special or general, to the contrary notwithstanding.

Given at Rome, at St. Peter's, under the Fisherman's Ring, this 2nd day of August, 1571, in the 6th year of our Pontificate.

The Chairman said the paper just read was one of the class of historical papers which were always interesting, although not of so practical a nature as some of the communications they were accustomed to.

In the discussion which ensued, allusion was made to the great scarcity of the true Mecca balsam, of which Mr. Hanbury stated that he had seen a good sample, in the Great Exhibition of 1851.

ON THE PURIFICATION OF GUM RESINS.

BY MR. ALFRED ALLCHIN.

In the last edition of the London Pharmacopœia a process was introduced for the purification of some of the gum resins used in medicine; it is as follows:—Take of either ammoniacum, assafœtida, galbanum, or sagapenum, one pound, water a sufficient quantity, boil the gums with the water, then strain and evaporate in a water-bath until they harden upon cooling.

Now my object in bringing the subject before the meeting this evening is to discuss the propriety of this purifying process, my own experience having strongly impressed me with the opinion that the means adopted for their purification has rendered them totally unfit for some of the purposes for which they were intended. These substances have been examined by Brande and other Chemists, and they are stated to consist principally of the following:—

Volatile oil,
Resin,
Gum.

The first change that becomes apparent on boiling these bodies in water is that the volatile oil is dissipated with the aqueous vapour, and the extent to which this takes place I think will be clearly shown by examining the condensed liquids that I have placed on the table. It will be seen, especially in the case of assafœtida, that a considerable amount of oil possessing a most powerful odour must be lost during evaporation, but in addition to this loss of volatile matter the non-volatile portion has become so altered in its physical condition as scarcely to represent it in its original state.

Ammoniacum.—In commerce we meet with ammoniacum in two different forms—in tears and in lump, the latter stated to be agglutinated tears, but probably having been subject to some heating process before assuming that condition. But the former is evidently nothing more than the natural dried milky juice that has exuded from the plant; and if we take some of it and triturate with water in the manner directed for making ammoniacum mixture in the old Pharmacopœia, we very easily suspend a great portion, which remains suspended many days, and has all the characters of a good emulsion; but if, on the other hand, we take some of the prepared ammoniacum, as directed in the new Pharmacopœia, we find the greatest possible difficulty in suspending any

portion, and the little that is suspended, after a very short period, falls to the bottom.

By boiling the ammoniacum with a small quantity of water and then evaporating to dryness, it becomes so altered that I believe it to be perfectly impossible to make a good mixture with it. It remains soft and plastic, consequently very difficult to reduce to powder, and much more difficult to mix and suspend in water. I have placed on the table two bottles containing the mixture made from the gum resin in its two different forms, and the inferiority of the one to the other will at once be seen.

Prepared assafœtida differs in some respects from prepared ammoniacum; when evaporated it becomes hard and friable, but still, when suspended by barley water, as it is ordered to be in the enema of assafœtida, it is very inferior to that made with the natural gum resin.

With galbanum and sagapenum I have had no experience; but when we consider how alike they are in composition to those I have already mentioned, I think we may very reasonably conclude that what takes place in the one will also take place in the other.

The object, no doubt, of the authors of the Pharmacopœia was to rid these substances of mechanical impurities, but if this can only be obtained at the expense of their decomposition, I doubt very much if it would not be better to use them in their natural condition, care always being taken to select those portions only that are the most pure.

Mr. Hanbury said he had frequently observed the very unsatisfactory results of the processes given in the London Pharmacopœia for the purification of gum resins. With sagapenum he had tried aqueous and spirituous extraction, and the subsequent admixture of the two extracts, but was not satisfied with the result. In Germany it was customary to expose the gum resins to cold during the winter, and then to powder and sift them, by which means some of the impurities were separated, but that method did not seem to be applicable to our climate.

The Chairman suggested that probably by treating the gum resins successively with ether, spirit, and water, all their active ingredients might be separated from the impurities, and by admixture afterwards rendered fit for use.

Mr. Hills thought the best way to bring about an improvement in the quality of the gum resins used in medicine, would be to induce those who collected them to pay more attention to their purity. Much had already been done in this way with reference to senna and scammony, and he saw no reason why, if the demand were made known, the same improvement should not be effected in the gum resins.

Mr. Long thought the influence of the Pharmaceutical Society might be very advantageously exercised in impressing upon those engaged in the importation of these substances the importance of having them collected in a greater state of purity.

Mr. Waugh thought this subject was well worthy the attention of the Council. Mr. Hills had referred to the improvements effected in the supply of senna and scammony in consequence of the attention directed to the subject by the Pharmaceutical Society, and he (Mr. Waugh) hoped that similar results would attend the labours of the Society in other cases.

Mr. Hanbury thought there was one difficulty in the way of influencing the collectors of the gum resins alluded to, which was, that it was not known where some of these substances came from, or how or by whom they were collected. There was reason to believe that the collectors lived in a half-civilized state, and could not be very easily influenced. He quite agreed, however, in the propriety of doing all that could be done in that way.

ON THE PREPARATION OF LIQUOR POTASSÆ.

BY THEOPHILUS REDWOOD, Ph.D.,
Professor of Chemistry and Pharmacy to the Pharmaceutical Society.

The process for the preparation of Liquor Potassæ is one of those which every Pharmaceutical Chemist may be expected to perform. The product is extensively used both as a chemical and pharmaceutical agent, its production is neither complicated nor difficult, and the apparatus required is of the most simple description.

In some of the applications of this solution it is very important to have it in as great a state of purity as possible, and although for use in medicine this great purity may not be essential, it is certainly desirable, if practicable, that it should be kept by Pharmaceutists in a state in which it will fulfil the requirements not only of the physician but also of the scientific chemist.

Simple and easy of execution as the process appears to be, and really is when rightly performed, it nevertheless readily admits of such deviations from the conditions essential to the required result as cause frequent, and sometimes considerable variations in the composition and properties of the product.

When rightly prepared, liquor potassæ should be a colourless and transparent solution of caustic potash in water, and should contain nothing more, excepting what is derived from unavoidable impurities in the materials employed in the process.

If pure carbonate of potash and good lime be used, a solution may be obtained which will nearly approach to chemical purity, but when salt of tartar is employed, as ordered in the London Pharmacopœia, the solution will necessarily contain the sulphate of potash and chloride of potassium originally present in the salt of tartar. The presence of these salts in the small quantities in which they are thus introduced is sanctioned by the London College, and does not affect the use of the solution for most chemical purposes. But if the solution be imperfectly prepared it may contain carbonate of potash which has remained undecomposed, and alumina and silica derived, the one from the lime and the other partly from the lime and partly from the potash. These are the most important contaminations to which the solution is subject. Sometimes, however, it contains lime in solution, and among the defects to which it is subject is that of want of uniformity in strength.

I propose this evening to offer a few remarks upon the different processes given in our Pharmacopœias and in chemical works for the preparation of Liquor Potassæ, and to describe the process which I consider best calculated to fulfil all the requirements of the Pharmaceutical Chemist. I purpose treating the subject in a strictly practical manner, not aiming at originality so much as to communicate the results of experience, and to point out and explain all the details of manipulation, so as to enable the class of operators for whom the communication is intended, to produce with certainty solutions which shall be definite and uniform in strength, and sufficiently pure for all ordinary chemical as well as pharmaceutical purposes.

Although caustic potash appears to have been known to the Greeks and Romans, and the preparation of its solution was described by writers in the first century, yet it was not until the middle of the last century that the process was understood, and that the real nature of the difference between caustic potash and the carbonate from which it is prepared was discovered. This discovery was made by Dr. Black, of Edinburgh, in 1756. Previously to this time there were several crude theories for explaining the action of lime in rendering potash caustic, some assuming that the lime removed a quantity of mucilage from the potash, and others that its action consisted in increasing the comminution of the potash.

At the period named, Dr. Black in Scotland, and M. Meyer in Germany, were simultaneously engaged in the investigation of the subject, but they came to very opposite conclusions. Black determined the composition of commercial potash, showing that it was a carbonate of the alkali, and he described the action of lime in removing the carbonic acid from the potash. Meyer, on the other hand, concluded that the potash deprived the lime of its causticity by taking from it an acid to which he gave the name of *Acidum Pingue*, or *Acidum Causticum*, this acid being considered the cause of causticity in lime, potash, and other similar bodies. There were advocates for each of these theories, but the contest was soon determined in favour of Dr. Black's.

The correct view thus acquired of the reaction which occurs in the production of *Liquor Potassæ* does not appear to have led to any very material alteration in the process generally adopted. A formula for its preparation was introduced into the London Pharmacopœia ten years before Dr. Black's discovery—that is, in 1746—under the name of *Lixivium Saponarium*, of which the following is a translation :—

"Take of

Russian Ashes,
Quick Lime, equal weights.

Drop water on the lime and ashes until the lime shall be slaked; then, water having been copiously added, agitate well, so that the saltness of the ashes may dissolve; afterwards, allow it to be at rest, and pour off the liquor, if necessary through filtering paper, into another vessel.

"A pint of this liquid, very carefully balanced, ought to weigh sixteen ounces: if it be heavier, for every drachm the pound exceeds, so many ounces and a half of water are to be added to each pint. But if it be lighter, the solution is to be boiled down until as many ounces and a half have been evaporated, or it is to be poured again on to fresh lime and ashes."

Now the pint or pound measure referred to in this formula was the old wine pint, which contained 7289 grains (troy) of distilled water, and as this measure of the solution was to weigh sixteen troy ounces, or 7680 grains, the specific gravity of the solution would be 1053.

I believe that no better process than this, as far as regards its general features, has ever since been given. It appeared in the Pharmacopœia of 1746, with reference to which work I have made the following remarks in the Supplement to the Pharmacopœia :*—

"Previous to the publication of the Pharmacopœia of 1746, the London College appointed a committee of their body for the purpose of suggesting such alterations as were thought desirable to be made. This committee appear to have entered upon their task with a determination of founding the formulæ upon the principles of simplicity. A most radical change was recommended by the committee, and carried out by the College. The arrangement of the work was entirely recast; nearly the whole of the old prolix formulæ were rejected, and those which were substituted for them may be said to have originated and formed the bases of the medicinal compounds which have chiefly been employed in this country from that day to the present. Dr. Plumtre was president of the College at the time this Pharmacopœia was published."

In the Pharmacopœia of 1788, the name of the solution was changed to *Aqua Kali Puri*, and a new process was given for it, as follows :—

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* Supplement to the Pharmacopœia; third edition, page 5.

"Take of

Kali .....4 pounds,
Lime .....6 pounds,
Distilled Water .....4 gallons,

Add four pounds of the water to the lime, and let them stand together for an hour, then add the kali and what remains of the water. Boil them for a quarter of an hour; allow the solution to become cold, and strain.

"A pound measure (a pint) of this solution ought to weigh sixteen ounces. If the solution effervesces with an acid, add more lime."

In this process the proportion of lime was increased, and the ingredients were directed to be boiled together. Believing as I do that these alterations did not tend to the improvement of the process, it is rather mortifying to find that they were introduced on the occasion of the first great chemical reformation being effected in our Pharmacopœia; for while the alterations made in 1746 related chiefly to what are called the Galenical preparations, those made in 1788 related principally to the chemical processes.

I pass now to the process in the present London Pharmacopœia, in which the lime, after having been increased in 1788 to one and a half times the weight of the carbonate of potash, has been reduced to one-third of what it was previously, that is, to little more than one-half the weight of the carbonate of potash. This is an error on the side of reduction as great, I believe, as the previous change was in the other direction. In this process boiling water is used, but the ingredients are not boiled together. In the process of the Edinburgh College the carbonate of potash is directed to be dissolved in the greater part of the water, this solution raised to the boiling point, and the lime, in the state of milk of lime, added in small successive portions while the solution is kept boiling. The process of the Dublin College does not essentially differ from this, and these two processes accord with the instructions generally given and recommended in chemical works.

We have thus three distinct and different modes of operating described for the preparation of this solution, and one of the questions I propose to consider is,—which of these modes of operating is the best?

Then, in all the Pharmacopœia processes to which I have referred, the lime is directed to be weighed in the state of quick lime. I propose to consider whether it ought not to be weighed, and its proportion adjusted, after it has been brought to the state of hydrate of lime or slaked lime.

I would suggest, also, that a slight alteration might with advantage be made in the strength of the solution as at present ordered in our Pharmacopœias.

I will refer to these questions in an inverse order to that in which I have just stated them.

1. *What is the best strength for the solution?* When made according to the London Pharmacopœia, its specific gravity is 1.063. According to Phillips, it contains in 100 grains 6.7 grains of potash, which means hydrate of potash, and this represents 5.5 grains of anhydrous potash. The preparations of the Dublin and Edinburgh Pharmacopœias are rather stronger than that of the London, the specific gravity of the first being 1.068, and that of the second 1.072. As these all differ, it will be necessary, in adopting a formula for the new Pharmacopœia, to deviate from at least two, if not from all of them. There would be a manifest advantage in making the strength such that the per-centage quantity of alkali present might be expressed by a whole number, while at the same time it is not desirable to deviate much from the strength which has been for so many years adopted in medical practice. It has been suggested that the solution should be made to contain ten per cent. of the alkali; but not only would this nearly

double the strength of the solutions now in use, but it would necessitate an entire and very disadvantageous change in the mode of producing the solution. The present solutions contain rather more than five per cent. of anhydrous potash, and I find, as the result of experiment, that using the carbonate of potash (salt of tartar of commerce) in the quantity nominally ordered in the present London Pharmacopœia, but substituting avoirdupois for Troy ounces (which change it is understood will be made in the new Pharmacopœia) the solution would contain five grains of anhydrous potash in one hundred grain-measures of the solution. The fluid drachm of this solution would therefore contain three grains of KO. The specific gravity of such a solution is 1.053, which is identical with that of the *Lixivium Saponarium* of the London Pharmacopœia of 1746. This would probably be the best strength to adopt. It has long been established that in order to get a caustic and tolerably pure solution of potash by the usual process, there must be about ten times as much water used as there is of carbonate of potash. It is only when these proportions are adhered to, that the carbonate of potash is wholly deprived of its carbonic acid by the lime, and that none of the excess of lime is retained in solution. Lime, if present as hydrate and in sufficient quantity, is capable of removing carbonic acid from carbonate of potash if the latter be dissolved in ten parts of water, and in a solution of this strength lime is not soluble. If the quantity of water be much less than that, the carbonic acid will not be wholly removed from the potash; or if, on the other hand, the proportion of water be much greater, although the decomposition of the carbonate of potash will readily take place, the solution formed will take up some of the excess of lime used in the process, and will be thus rendered impure. The proportions of carbonate of potash and water which can be advantageously used, are therefore restricted within narrow limits.

2. *Should the lime be weighed as quick lime or as hydrate of lime?* In most of the published formulæ, including those of our Pharmacopœias, quick lime is ordered, a specified quantity of which is directed to be first converted into hydrate and then added to the carbonate of potash previously dissolved. In the London process eight parts of quick lime are used with fifteen parts of carbonate of potash. This quantity, although more than enough to form carbonate of lime with the carbonic acid of the carbonate of potash, is nevertheless insufficient to ensure a satisfactory result. It is found to be advantageous to use two atoms of lime in the state of hydrate for every atom of carbonate of potash, the formation of the compound CaO,CO_2+CaO,HO being effected much more easily than neutral carbonate of lime (CaO, CO_2). If the lime ordered in the London process were all pure lime the quantity would not be sufficient to form the above compound, but the lime of commerce is never pure, and frequently contains a large proportion of foreign matter, much of which cannot be readily distinguished from it, unless it be in the process of slaking. It is by the facility and completeness with which the slaking takes place that the quality of the lime is best judged of, and when this process has been effected the pulverulent hydrate may without difficulty be separated from the foreign matters and bad pieces of lime by passing it through a sieve of about 25×25 meshes to the square inch. I would suggest that the lime should be thus obtained in the state of dry hydrate, and that equal quantities of this and carbonate of potash (salt of tartar) should be employed in the process.

3. *Should the ingredients be boiled together, or is it necessary or desirable to use boiling water in the process?* The London College directs boiling water to be used, while the Edinburgh and Dublin Colleges order the ingredients to be boiled. The latter mode of operating is that generally recommended in chemical works. It effects a more speedy decomposition of the carbonate of

potash than occurs when heat is not used, and it causes the carbonate of lime to assume a more aggregated state, so that it subsides more quickly in the solution. It is also stated by some authors that the silica which the carbonate of potash may contain is precipitated in combination with lime by boiling. This, however, I have not found to be the case if the boiling be continued only for a sufficient time to effect the decomposition of the carbonate of potash.

Whatever advantage there may be in boiling, or in the use of boiling water, in particular cases, I do not consider either of those methods of operating the best that can be adopted as a pharmaceutical process. If the ingredients are to be boiled the process must be performed in an iron vessel, iron and silver being the only two substances that can be applied in that way without being acted upon by the boiling solution, and the latter being excluded from general use by its costliness. The process of boiling the ingredients in an iron vessel is subject to several objections, among which may be mentioned the liability to contaminate the solution with matter derived from the vessel employed, the difficulty of accurately adjusting the strength of the solution after loss by evaporation, and the inconveniences attendant upon the process throughout. The process of mixing the solid ingredients with boiling water, as ordered in the London Pharmacopœia, is also subject to objection. What vessel is to be used for mixing the ingredients? The boiling water cannot be put into a glass bottle without danger of cracking it, nor, indeed, can such a quantity of the ingredients as is usually operated upon be confined at a boiling temperature in any appropriate vessel, so as to admit of their being subjected to the requisite agitation, without much inconvenience and even danger. The consequence is, that in operating by this process the ingredients are often mixed in an uncovered earthen pan and occasionally stirred, or if put into a stone bottle, the agitation to which they are subjected, as in the preceding case, is insufficient to accomplish the required object. The processes involving the application of heat are not, therefore, likely to yield uniformly satisfactory results, and to the defects in this and other respects in the processes of our Pharmacopœias, may no doubt be referred the imperfections which too often occur in Liquor Potassæ. These imperfections were brought under notice about eighteen years ago by the late Mr. Richard Phillips, in one of a series of communications published in the *Pharmaceutical Journal*, vol. ii., page 397. Mr. Phillips found that Liquor Potassæ, as met with in commerce, was subject to considerable variation in strength, and generally contained carbonate of potash.

Statements to a similar effect have been made on other occasions, and there is reason to believe there is still room for improvement in this preparation. One of the impurities it very commonly contains is alumina derived from the lime, and as Liquor Potassæ is employed as a reagent in the detection of alumina, this contamination of course precludes its being used for that purpose. Chemists have often found it difficult to procure solution of caustic potash free from alumina and fit for use as a chemical reagent. Now, I find that when the solution is made either by boiling the ingredients together, or by using boiling water, the product is much more likely to be contaminated with alumina than it is when made with cold water.

For the reasons stated, I object to the application of heat in the preparation of Liquor Potassæ. It is unnecessary, as the decomposition of the carbonate of potash may be easily effected at common temperatures if certain conditions be attended to; and by operating without heat, the process is deprived of the sources of difficulty and inconvenience to which reference has been made.

The following process is recommended as one which, in the hands of pharmaceutists, is calculated to yield uniform and satisfactory results:—

LIQUOR POTASSÆ.

Take of

Carbonate of potash,
Hydrate of lime, each ℥viiss,
Distilled Water, Oiv.

Mix the slaked lime with three pints of the water, and put the mixture into a green glass stoppered bottle (a Winchester quart). Dissolve the carbonate of potash in the remainder of the water, and add this solution, in small quantities at a time, to the milk of lime, shaking the bottle for some minutes after each addition; and when the whole of the ingredients have been thus mixed, continue the agitation until a portion of the filtered liquid no longer evolves carbonic acid gas on the addition of an excess of hydrochloric acid. Then filter the solution through calico.

This process differs from that of the present London Pharmacopœia—1st, in the substitution of cold water for boiling water; 2nd, in the substitution of hydrate of lime for quick lime; 3rd, in the use of an increased quantity of lime; 4th, in the reduction of the quantity of solution ordered to one half (from a gallon to half a gallon). These alterations are important. Thus, by using cold water instead of boiling water, all difficulties in conducting the process, including the selection of a suitable vessel in which to mix the ingredients, are removed. A green glass stoppered bottle, the most appropriate apparatus for the purpose, may be employed, and as the quantity ordered is half a gallon, a Winchester quart bottle, which every druggist has in his store-room, will just hold this quantity. By ordering the lime to be weighed in the state of hydrate, the use of bad lime, and the impurities which accompany it, is to a great extent precluded. By increasing the quantity of lime, provision is made for the production of the compound of carbonate and hydrate of lime already alluded to, after allowing for some impurity which will be retained even in the hydrate of lime, and also for uncombined water which may be present. Lastly, by reducing the total quantity ordered in the formula, such a quantity is indicated for an operation as can be easily subjected to the active and continued agitation required to effect the complete decomposition of the carbonate of potash within a moderately short time. When good hydrate of lime is used, the decomposition may be effected in about half an hour by continued and very active agitation.

The ingredients being confined in a stoppered bottle, which is itself a measure of the quantity, there are but few probable sources of error in the process or of defect in the product, provided the solid ingredients be in a sufficient state of purity and accurately weighed. If from any cause the process when commenced cannot receive continued attention up to its completion, no evil will arise from the ingredients being left at rest until another opportunity for shaking the bottle presents itself. It must not be supposed, however, that such periods of rest contribute much, if anything, to the decomposition of the carbonate of potash by the lime, as the latter quickly subsides to the bottom of the vessel, and then, of course, ceases to produce any effect upon the carbonate of potash contained in the solution above it. I have found the agitation of the mixture to be most easily effected by placing the bottle on its side, with a folded cloth under it, on a table, and rolling it to and fro with a short quick motion, one hand of the operator being placed over the stopper of the bottle. In operating thus without heat there is not much probability of the stopper becoming fixed in the mouth of the bottle, unless the process be protracted; if, however, the solution has to be kept for any length of time in a well-stoppered bottle, it will be found advantageous to put a piece of thin gutta percha tissue between the stopper and the mouth of the bottle, which will effectually prevent the adhesion of the

stopper, which otherwise often occurs. A small quantity of the solution must be filtered from time to time to test it for carbonic acid, and when it has become nearly caustic the filtration of even a drachm or two cannot be well effected through paper without causing the latter to break, but a small calico filter will be found fully to answer the required purpose. When the solution is found to be perfectly caustic it may either be filtered at once through calico or linen, or the precipitate may be allowed to subside and the clear liquor decanted off. In the latter case, some days should be allowed for the subsidence of the precipitate, the particles of which will become more and more aggregated, thus occupying a smaller space and leaving a larger amount of supernatent liquid. The aggregation of the precipitate will thus take place in time to nearly the same extent as occurs more quickly when the ingredients are boiled together. If the solution be filtered, this may, and indeed should, be done before the precipitate has aggregated into a hard mass at the bottom of the bottle. It does this after standing for some time, and is then removed with difficulty. A calico or linen filter should be used, as neither of these are sensibly acted upon by the caustic solution, especially after they have been once used. When new, a little colour is taken from them, and more particularly from the linen, but this is removed by the first portion filtered, or the effect may be prevented by previously washing the filter with some caustic alkali, and the same filter may be afterwards employed repeatedly without any further contamination of the liquid. The filtration will take place most rapidly through the conical filter-bag, commonly called *Hippocrates' sleeve,* which, when used for this purpose, instead of having a hoop to keep the mouth open, should be merely provided with a wide hem having three equidistant openings to admit three pieces of straight glass rod passed through the hem from one opening to another, and these must be long enough to project a little way out of the openings in each direction. Three cords with loops placed over these projecting ends will afford the means of suspending the bag when in use, and on afterwards withdrawing the rods the bag may be easily washed and put away until again required. If it should be thought that this method of filtration would expose the solution too much to the air, a piece of calico or linen may be cut to the form of an ordinary filter, and placed in a funnel covered with a common plate, the neck of the funnel being inserted into the mouth of a green glass bottle intended for the reception of the liquid. In the filtration of Liquor Potassæ, it is important that the precipitate as well as the solution should be put into the filter. In fact, it is the precipitate that forms the most efficient filtering medium; without it the liquid would not pass through clear; but if the whole of the precipitate be turned into the bag or other filter with the liquid, the latter will almost immediately run through sufficiently clear for use. This filtration or percolation of the liquid through the precipitate also serves to effect the decomposition of any remaining portion of carbonate of potash if there should be such. I have sometimes completed the decomposition in this way by passing the solution through the precipitate several times, and have found it an expeditious mode of operating.

Liquor Potassæ prepared by this process will be as free from impurity as the nature of the substances used for its production will admit. The alumina always present in the lime, although dissolved to a considerable extent in the early part of the process, before the decomposition of the carbonate of potash is complete, is ultimately precipitated by the excess of lime with which it forms a compound insoluble in the cold. To some extent this precipitation is effected when heat is employed, but in operating with heat, a little alumina is retained in solution. In this case, even repeated agitation after the liquid has cooled, does not entirely remove the alumina, unless some fresh milk of lime be added.

The absence of alumina is an important feature in the Liquor Potassæ made by the cold process, and one that will be appreciated by those who have occasion to use it for chemical purposes. To ensure the absence of this contamination, however, it is essential that excess of lime should be used, and this is one of the objects contemplated in augmenting the quantity of lime ordered, and endeavouring to ensure its good quality.

The silica which commercial carbonate of potash contains, will be dissolved by the caustic alkali, and this constitutes one of the usual impurities of Liquor Potassæ. It is stated by some authors that, in the process of boiling, the silica forms an insoluble compound with lime, and is thus removed; but I do not find that this separation is complete. There is a little silica retained in solution, whichever process is adopted, and I cannot discover any difference in the quantity present in solutions prepared from the same materials by the different processes.

There are thus, I think, several advantages which attend the preparation of Liquor Potassæ by the process I have described. This process is more easily performed than any of those contained in our Pharmacopœias, and it is less likely to yield products of variable strength and quality. There is one point, however, to which attention must be particularly paid, and that is the condition of the carbonate of potash. I have assumed that the so-called salt of tartar of commerce, which the London College orders, is to be used in the process. This, according to the Pharmacopœia, is a sesquihydrated carbonate, containing sixteen per cent. of water; but as it rapidly absorbs more water on exposure to the air, it cannot be relied on as a definite compound in the state in which it is met with in commerce. Unless it be perfectly dry, and does not in the least adhere to the bottle containing it, it should not be used without being previously heated with constant agitation in a porcelain dish placed over a water-bath. It is readily tested with regard to the water it contains by the means indicated in the Pharmacopœia. One hundred grains of it, on being heated to redness, should lose sixteen grains.

The proposed formula for Liquor Potassæ is so constructed that, if troy weight be used, the solution will be identical in strength with that now ordered in the London Pharmacopœia, but if the avoirdupois ounce be substituted for the troy ounce, the strength of the solution will be slightly reduced, so that one hundred grain-measures of it will contain five grains of anhydrous potash (KO), and the specific gravity of this solution will be 1.053.

Mr. Hanbury inquired of the author of the paper whether he thought non-effervescence on the addition of an acid was a sufficient test of the absence of carbonic acid.

Dr. Redwood thought it quite sufficient in all ordinary cases, but if a more delicate test was required, lime water might be added after diluting the Liquor Potassæ with an equal volume of distilled water.

PHARMACEUTICAL MEETING, EDINBURGH.

The Third Scientific Meeting of the Society, for the present session, was held in George Street Hall, on Thursday evening, the 7th of February;

MR. J. R. YOUNG, PRESIDENT, IN THE CHAIR.

The following communications were made:—

"On the Chemical Biography of an Animal, with special reference to those animal products which are employed in pharmacy," by Dr. Stevenson Macadam, F.R.S.E.

"On the manufacture of Pyroxyline for Photographic Purposes," by Mr. NICOLL.

In this communication the author gave the following description of the process he recommends:—

Into a well glazed porcelain dish, considerably deeper than an evaporating dish, and holding about 30 ounces, I put 10 fluid ounces of sulphuric acid s. g. 1.840; on this I pour 5 fluid ounces of nitric acid s. g. 1.370, and then 2 fluid drachms of water; the temperature at once rises to about 150°. If the cotton be immediately immersed it gives what is known as "powdering collodion," a state similar to what is produced by age, and very suitable for certain "dry processes," but for general purposes I let the temperature fall to about 140°, and then, armed with two glass rods, an assistant adds, tuft by tuft, 5 drachms of good cotton; as each tuft is added it is pressed into the acid, and the whole kept moving about to ensure equal action. When the whole of the cotton is in, the dish is covered with a plate of glass and left for ten minutes; it must, however, be carefully watched during this time, the acids being not much above the dissolving point, actual solution occasionally begins at some place but is immediately stopped by a press with the rod.

Although the 5 drachms of cotton does not absorb the whole of the acid, that quantity must not on any account be exceeded, the change taking place being the conversion of portions of the hydrogen of the cotton and the oxygen of the nitric acid into water; the addition of a single half drachm is sufficient to change the nature of the product, and occasionally to produce solution of the whole. At the expiration of the ten minutes, I, as rapidly as possible, press the cotton between two strong strips of glass and plunge it into a large quantity of water, when it is instantly teased out, and rapidly moved about to diffuse as quickly as possible the adhering acid through the whole volume. Nothing then remains but to wash till every trace of acid is removed; this is conveniently and effectually done by packing in a percolator and turning on a stream of water for a few hours, and drying either by steam or otherwise.

It may seem that the quantity of material operated on at a time is small, but experience shows that large quantities considerably affect the result; but that is no great objection, as with two dishes and an active assistant, the pyroxyline may be easily turned out at the rate of 5 ounces per hour.

CHEMICAL DISCUSSION ASSOCIATION OF THE PHARMACEUTICAL SOCIETY.

THE third anniversary meeting was held at 17, Bloomsbury Square, on Thursday, January 31st, 1861;

DR. T. REDWOOD, PRESIDENT, IN THE CHAIR.

The following Report of the Committee was read:—

"It is the present duty of the Committee to report to the members on the progress which has been made by the Chemical Discussion Association during the past year. The subscriptions which have been received have, as will be seen by the Treasurer's report, been sufficient to cover all expenses. The number of members who paid for 1859 was thirty-one; of these only eighteen have subscribed for 1860. Of the thirteen members who have not paid their current subscriptions, four have resigned, thus leaving nine defaulters. Five new members have been admitted during the year, which brings the number of subscribers for 1860 to twenty-three. Several of the members who joined the Association during the first year of its existence were at the time studying in the Laboratory of the Pharmaceutical Society, or otherwise temporarily engaged in London. These gentlemen have since established themselves in the country, and having no further opportunity of benefiting by the meetings and discussions, have ceased their subscriptions, and are not likely to take any active part in the Association in future. The only means of removing these members from the list is by Rule XI., which states that 'Any member whose subscription is in arrear for three years may be removed by the Committee from the list of members.' The present Committee, however, conceiving

that the list of members should fairly represent the strength of the Association, consider that this period of three years is unnecessarily long, and that it would be advantageous to shorten it to one entire year. They therefore propose that Rule XI. be altered to the following :—

> 'Any member desiring to withdraw from the Association, shall signify the same in writing to the Secretary. Any member whose subscription is in arrear for *one entire year* may be removed by the Committee from the list of members.'

While, however, provision will be thus made for more readily removing those who cease to support the Association, the necessity arises for replacing them by new members. The Committee wish to point out that the source of loss specified above, will probably be to a greater or less extent of annual occurrence, and that, therefore, the members should be constantly endeavouring to gain the co-operation of those likely to advance or benefit the objects in view.

"Eight ordinary meetings have been held during the past year. These have been pretty well attended, and a fair supply of communications obtained. Several of the subjects which have been discussed at these meetings have been afterwards taken in the form of papers to the meetings of the Pharmaceutical Society, and published in the *Pharmaceutical Journal*. This was one of the objects contemplated at the establishment of the Association, and one to which the Committee attach considerable importance."

The following are the subjects of the communications which have been made to the Association during the year :—

"On the Preparation of the Phosphates of Iron."

As was stated in the Report of the Committee for the year 1859, a communication was first made on this subject by Mr. Gale to a meeting of the Association in December of that year. As it was then understood, however, that further experiments would be brought forward and considerable discussion was likely to ensue, the Committee refrained from further noticing the subject. Three subsequent meetings were partly occupied with communications on these phosphates, and all the facts which were elicited during the discussions were afterwards embodied in three papers, which were read at the evening meeting of the Pharmaceutical Society for March, 1860, by Mr. S. Gale, Mr. Julius Schweitzer, and Mr. J. Robbins, and were published in the *Pharmaceutical Journal*.

"On the employment of Heat as an Auxiliary in Dispensing." By Mr. Haselden.

"On Unguentum Hydrargyri Nitratis." By Mr. J. Schweitzer.

"On Dugong Oil." By Mr. Fewtrell.

"On Liquor Taraxaci and on Succus Limonis." By Mr. J. Schweitzer.

"On the Adulteration of Carmine." By Mr. Attfield.—This paper was afterwards read at the Pharmaceutical meeting for April.

"The Saccharine Iodide of Iron of the Prussian Pharmacopœia." Mr. Schweitzer.

"On the Spontaneous Decomposition of Chloroform." By Mr. Attfield.

"On the Presence of Alumina in Liq. Potassæ." By Mr. Wood.

"On the Residue of Opium after the Preparation of Extract." By Mr. Schweitzer.

"On a Method of obtaining Impressions of Leaves and Ferns." By Mr. J. Ince.

"On the Oxidation of Cod Liver Oil." By Mr. Robbins.—This subject was first introduced at a meeting of the Association by Mr. Robbins, who exhibited the results of some of his experiments. In the course of the discussion it was suggested that an ultimate analysis of the products would be desirable. This was undertaken and performed by Mr. Attfield. A paper on the subject was afterwards published by the latter member in the *Pharmaceutical Journal* for August.

"On Edible Oil." By Mr. Haselden.

"On the Nomenclature of the Salts of Mercury, particularly with reference to Use in Prescriptions." By Mr. Attfield.

"On Commercial Disulphate of Quinine." By Mr. J. Schweitzer.

"On Accidental Poisonings." By Mr. J. Schweitzer.—This paper was afterwards read at the Pharmaceutical meeting for January, 1861.

"On the Deposit occurring in Ipecacuanha Wine." By Mr. Haselden.

The Treasurer's Account showed a balance in hand of 12*s.* 6*d.*, subscriptions received during the year having amounted to £6.

It was proposed by Mr. A. Allchin, seconded by Mr. Francis, and resolved—"That the Report of the Committee be adopted, and that the alteration in Rule XI., suggested in the report, be affirmed by the meeting."

The following resolution, which had been passed by the Committee, was read to the meeting:—

"That in accordance with Rule I., Messrs. Gale, Wood, Attfield, and Schweitzer shall retire from the Committee. That the Committee do recommend to the general meeting that these members be re-elected."

No other candidate being proposed, the above gentlemen were elected.

A paper was afterwards read by Mr. Allchin "On the Purification of Gum Resins."

ORIGINAL AND EXTRACTED ARTICLES.

ON ACTÆA, OR *CIMICIFUGA RACEMOSA.*

BY ROBERT BENTLEY, F.L.S., M.R.C.S. ENG.

Professor of Materia Medica and Botany to the Pharmaceutical Society; Professor of Botany in King's College, London.

History.—The so-called root of this plant has long been a popular remedy in consumption, bronchitic affections, and various other disorders, in several of the Western States of the American Union. It was first introduced into regular practice in America by, Dr. Garden, of Virginia, in 1823, as a medicine of great value in tubercular consumption.* Since that period it has been extensively employed in various affections in North America with great success, and has been for many years officinal in the United States Pharmacopœia, under the name of *Cimicifuga*.

Within the last few months it has been brought under the notice of the medical profession in this country, by Dr. Simpson, of Edinburgh, so well known as the introducer of many valuable remedies, who has spoken most favourably of its employment as a remedial agent, in chorea, rheumatism, and other affections; and, as it is now coming into frequent use, and bids fair to become an important article of our Materia Medica, it is very desirable that a detailed account of it, and its preparations, should appear in the pages of the *Pharmaceutical Journal.*

Synonyms.—The plant from which this remedy is obtained has received various names from the different authors by whom it has been described. It is the *Actæa racemosa* (Linn., spec. 722, and Willd., spec. plant 2, 1139); the *Cimicifuga racemosa* of Torrey, Gray, and Barton; *Macrotys racemosa* (Eaton, and Raff.); *Actæa monogyna* (Walt.); *Cimicifuga Serpentaria* (Pursh.); *Christophoriana racemosa* (Tourn.); and the *Botrophis Serpentaria* and *racemosa* of some other authors. In common language, it is known, as *black snake-root*, *cohosh*, *black cohosh*, *squaw-root*, *bugbane*, &c. &c.

It owes its name of *cimicifuga* (which is derived from *cimex*, a bug, and *fugo*, to drive away), and its more common appellation of *bugbane*, to the popular belief, that its fœtid leaves have the power of driving away bugs. A nearly allied species, namely, the *Actæa cimicifuga* of Linnæus, the *Cimicifuga fætida* of Gærtner, a native of Siberia, has a similar reputation in that part of the world. The name of *black snake-root* appears to be derived from the popular notion

* *American Medical Recorder*, for October, vol. vi., p. 609.

entertained of its power in curing snake bites, and those of other venomous reptiles; but, from the resemblance which its radicles have in form and general appearance to those of *Serpentary* or *Virginian snake-root*, except in their blackish colour, the name may be thus derived.

Botany.—*Actæa racemosa* belongs to the Natural Order Ranunculaceæ, and to the tribe Pœonieæ of many authors. The plants of this tribe are distinguished from other Ranunculaceæ, by their *introrse anthers*. In the Linnæan artificial system, the genus Actæa is commonly arranged in the Polyandria Pentagynia, although some of the species, as is the case in *Actæa racemosa*, have but one carpel. Generally speaking, the species of this genus vary in the number of their carpels, and thus illustrate in a striking manner, the difficulties which must always attend the practical application on a large scale of the once celebrated Linnean system.

Generic Character.—Calyx regular, deciduous, petaloid, 4-5-leaved. Petals 4. Carpels 1-5, many seeded. Herbaceous perennial plants.

Specific Character.—Stem simple, 3-8-feet high. Leaves more or less divided in a ternate manner, with oblong-ovate leaflets, which are serrated, toothed, or incised at their margins. Raceme much elongated. Carpel solitary, dry, dehiscent.

Habitat.—Native of North America, growing in moist, shady, or mountainous woods; or in ground which has been recently cleared; from Canada to Florida. It flowers during the months of June and July.

Collection and Commerce.—The rhizome is usually collected for medicinal purposes in the autumn, as it is generally regarded as most active when obtained at that period. It is imported into this country from the United States.

Description.—The so-called root, as imported, generally consists of entire or sliced portions of rhizomes, from which a variable number of radicles or rootlets arise below; or separated portions of the latter are found mixed with the rhizomes. In some imported specimens, the radicles are almost entirely absent. The *rhizomes* vary from about one-third to one inch in thickness. They rarely however, attain the latter size; their average diameter being about half an inch. Their length varies from one to several inches, usually being from two to three inches. They have a somewhat flattened cylindrical form, and are more or less twisted; and when of any length, furnished above with several projections, which are frequently an inch or more long, and are the remains of former aërial stems. Externally, they are marked with transverse ridges, produced by the falling off of the leaves, and between which are numerous irregular longitudinal striæ, alternating with corresponding elevations. In colour, they are dark brown or nearly black. Internally, they present a whitish or yellowish white colour, sometimes with a dark central portion. They break with a close, somewhat resinous looking fracture, and exhibit upon a transverse section, a large central pulpy portion, around which is disposed an annular layer of coarse woody bundles, which are separated by large medullary rays. In some specimens of the rhizomes, these woody bundles are very evident, and may be seen to radiate from the centre to the circumference of the woody axis or meditullium, but in most of those which I have examined, they only extend to a short distance from within the cortical portion through the meditullium. The cortical portion is much smaller than the meditullium, and is generally firmly adherent to it in the smaller rhizomes, but readily separable in the larger. The rhizomes when long dried, have scarcely any odour except when they are bruised or moistened with boiling water, when they possess a slightly narcotic one; but in a fresh state, or when recently dried, they have a peculiar, heavy, narcotic odour, somewhat resembling a mixture of aconite and liquorice roots. The fresh and recently dried rhizomes have a bitter, slightly acrid, and some-

what astringent taste, but if they have been long kept, these qualities are less evident. The diminished odour and taste of the long dried rhizomes, would lead to the conclusion that, they were less active than when in a recently dried, or fresh state, and this idea is fully borne out by the more satisfactory results obtained by the administration of the latter as remedial agents.

The *radicles*, as already noticed, vary much in number in the dried imported specimens of Cimicifuga,* which arises in a great measure from their brittleness, and consequent falling off unless carefully handled and packed. As these radicles are, according to our experience, more powerful than the rhizomes, they should be carefully preserved. These radicles vary in length from one to several inches; in the latter case they form an interlacing twisted tuft, somewhat like those of the Virginian snake-root. Their average size is about that of a common knitting needle. They are smooth or irregularly striated externally, and of a blackish-brown colour. The small radicles have a rounded outline, but the larger are usually more or less angular. They present a close, somewhat resinous fracture, and consist of a dark cortical portion, surrounding a whitish meditullium. The lighter coloured woody bundles of the meditullium radiate from the centre, and are commonly arranged in a cross-like, or triangular manner; thus, they will be cruciate or cross-like when there are four woody bundles, and triangular when there are but three, the former is by far the more common arrangement. If the woody bundles are more numerous than four, which will be the case in the largest radicles, these appearances are lost, and five or more radiating portions will be observed. As the radicles are rarely, however, of any size, this cross-like distribution of the bundles is one of the best distinctive characters of cimicifuga. In their odour and taste, the radicles resemble the rhizomes, although I am inclined to think that these characters are more marked in them. So far as our present knowledge of cimicifuga extends, we are led to conclude, that when required for medicinal use, *it should be obtained as freshly dried as is possible, and a good portion of radicles should be mixed with, or attached to, the rhizomes.* It is most probable, that inattention to these particulars has led to the failure of this remedy by some who have recently tested its medicinal properties.

Composition and Chemical Characteristics.—No satisfactory analysis has, as yet, been made of cimicifuga, but, according to Mr. Tilghmann,† it contains *starch, gum, sugar, wax, fatty matter, resin, tannic acid, gallic acid, black colouring matter, green colouring matter, salts of potassium, calcium, iron, magnesium*, and *woody matter.* No alkaloid or analogous principle has, at present, been obtained from it, but a resinoid extract‡ may be procured by precipitation from the concentrated tincture of cimicifuga by water.§ This has been termed *cimicifugin* or *macrotin*, and possesses to some extent, but by no means entirely, the active properties of the root. (See *King's American Eclectic Dispensatory*). Cimicifugin may be also obtained in a purer state, by exposing a strong alcoholic tincture of cimicifuga to spontaneous evaporation until the resinous matter is deposited, then carefully pouring off the remaining fluid, redissolving the resin in spirit, then slowly evaporating the solution to the consistence of a fluid extract, and lastly, putting this in thin layers upon glass, and drying it gradually. This process was first suggested by Professor E. S. Wayne.‖ There appears to be little doubt but that the active properties of cimicifuga are also due, in some

* As this name is the officinal one for black snake-root in the United States Pharmacopœia, we shall adopt it here, and it would be perhaps desirable generally to do so in this country.

† *Amer. Journ. Mat. Med.*, vol. ii., p. 301.

‡ *Amer. Journ. Phar.*, vol. xxiii., p. 329.

§ *Pharmaceutical Journal*, vol. xvi., p. 273.

‖ *Parrish's Practical Pharmacy*, 2nd Edit., p. 192.

degree at least, to a volatile principle, as its virtues are much impaired by being kept for any length of time.

The active properties, in whatever they consist, are taken up by water and alcohol, but alcohol is the best solvent. Hence, water and alcohol are commonly used in the medicinal preparations of cimicifuga. (*See Administration and Doses in this paper.*)

An infusion of cimicifuga, made by macerating one ounce of the rhizome and mixed radicles, in thirty ounces of boiling water, afforded the following reactions:*—

Tincture of Litmus produced a slight reddening; *Solution of Perchloride of Iron*, a dark bluish-black colour and abundant precipitate; *Tincture of Iodine*, a deep bluish-black colour; *Solution of Sulphate of Copper*, no immediate change, but in the course of a minute or two, the infusion became cloudy, and ultimately deposited a dirty-brown precipitate. With a *Solution of Chloride of Barium*, a brownish precipitate was obtained; with *Tincture of Galls*, a slight precipitate took place; *Solution of Chromic Acid* heightened the colour, and ultimately produced a slight brownish-black precipitate; *Solution of Chloride of Lime* deepened the colour, and formed a brownish precipitate; *Solution of Diacetate of Lead* gave a most abundant yellowish-brown precipitate; *Solution of Tartar Emetic* and *Solution of Gelatine* produced no appreciable change in the infusion, although cimicifuga is said to contain gallic acid as one of its ingredients. No perceptible effects were produced by *sulphuric*, *nitric*, or *hydrochloric* acids; nor by *solutions of ammonia*, *oxalate of ammonia*, *ferridcyanide of potassium*, *bichromate of potash*, *carbonate of soda*, *sulphate of soda*, and *sulphate of magnesia*. These reactions are thus particularly alluded to, as they may form, to some extent, a guide to the prescribers of cimicifuga.

Rhizomes, and Roots, resembling Cimicifuga, and their distinctive Characters.—The only roots and rhizomes which, I think, would be likely in this country to be confounded with cimicifuga, are, *black hellebore* and *aconite*; for although the radicles of cimicifuga resemble, in some respects, those of *Serpentary* or *Virginian Snake-root*, their darker colour and different odour should at once distinguish them.

The resemblance of cimicifuga to the larger rhizomes of black hellebore is, upon a superficial examination, most striking; and to some extent, although much less so, cimicifuga resembles aconite root. Hence it is very important, that substances differing so widely as these do in their properties, should have their distinctive peculiarities fully pointed out. In order, therefore, that they may be readily noticed, we present them in a tabular form as follows;—

1. General Distinctive Characters.

Cimicifuga.	*Black Hellebore.*
Rhizome, when of any length, marked with large and commonly long projections, which are the remains of former stems.	Rhizome with small short projections; more twisted and knotted in appearance than cimicifuga, and sometimes branched so as to resemble a piece of coral.
Radicles with a meditullium, in which the woody bundles are arranged in a cruciate, triangular, or more or less radiate manner.	Radicles with an undivided, or but very slightly stellate meditullium.
Odour narcotic, especially when freshly dried.	No marked odour in a dried state.

* These experiments were made with specimens forwarded to the Pharmaceutical Society, by Professor Procter, of Philadelphia.

2. Chemical Distinctive Characters.

An infusion made by macerating 1 ounce of cimicifuga and black hellebore, respectively, in 30 ounces of boiling water, exhibited the following distinctive chemical peculiarities:—

	Cimicifuga.	*Black Hellebore.*
Solution of Perchloride of Iron.	Deep bluish-black colour, and abundant precipitate.	Only a slight change of colour.
Solution of Sulphate of Copper.	No immediate change, but in the course of a minute or two the infusion became cloudy, and soon deposited an abundant dirty-brown precipitate.	No perceptible change during the first five minutes.
Solution of Chloride of Barium.	Brownish precipitate.	No change.
Solution of Chromic Acid.	Colour darkened, and slight brownish-black precipitate produced.	No marked change.
Solution of Chloride of Lime.	Colour deepened, and a brownish precipitate formed.	Colour nearly destroyed.
Tincture of Iodine.	Produces a clear bluish-black colour.	Produces a dirty brownish-black colour.

The above characters will at once enable any one to distinguish with facility and certainty, *black hellebore* from *cimicifuga*. The ready distinction of these two substances is rendered most important, for although the substitution of one for the other, by intention or accident, has not as yet, as I am aware, been noticed, still it is very likely to occur, for the rhizome and radicles of *Actæa spicata*, or baneberry, a nearly allied species to *Actæa racemosa*, and which is found growing wild in Yorkshire, and some other parts of this country, has already been supposed to have been substituted on the Continent, and in America,* for black hellebore. It has been called, on this account, *radix hellebori nigri falsi*.†

Guibourt ‡ has described a *false black hellebore*, which resembled the root of *Actæa spicata* in colour and texture, but differed from it in odour and taste, in which particulars it resembled black hellebore. This false root, which came from the South, he believed to be derived from *Helleborus fœtidus*, and he attributed the different appearance which this root from the Alps of Savoy presented to that of the ordinary root of the same plant found growing further north, to the different conditions of climate, &c., to which it had been exposed. It would appear from Guibourt's remarks, that he thinks that the *false black hellebore root*, as described by writers on Materia Medica, is not derived from *Actæa spicata* at all, but from *Helleborus fœtidus*.

The substitution, or admixture, of other roots for, or with, those of Black Hellebore, has not as yet been noticed by authors to occur in England; and Pereira says, as far as he had observed, the roots sold in this country as black hellebore, had a very uniform appearance, and from this he had not any reason to suspect any intermixture of other roots.§ My attention having been particularly drawn to the subject whilst writing this paper, I found that, at the present time, black hellebore root varied much in appearance; indeed, a sample of black hellebore root? obtained from one of the first wholesale houses in this country, was wholly composed of false roots. Upon examination, I found that these false

* Wood and Bache's *United States Dispensatory*, 11th Edit., p. 398.

† Murray's *Apparatus Medicaminum*, vol. iii., p. 48; also *Amer. Journ. of Pharmacy*, vol. xx., p. 163; also *Pereira, Mat. Med.*, 3rd Edit., p. 2163.

‡ *Histoire Naturelle des Drogues Simples*, 4th Edit., vol. iii., p. 693.

§ *Pereira's Mat. Med.*, 3rd Edit., vol. ii., p. 2163.

roots closely resembled in appearance, structure, and chemical reactions, those of *Actæa spicata;* authenticated specimens of which I obtained from the Royal Botanic Society's Gardens, for comparison. It is possible, indeed, that they might have been derived from another closely allied species of *Actæa*, but of their origin from a plant of this genus, I have no doubt. I have since found this *false black hellebore root* in several cases, and hence, I have reason to believe that, its substitution for, or admixture with, *true black hellebore root*, is by no means uncommon in this country. The readiest means of distinguishing this false hellebore root from the true is, by the cruciate, or radiate disposition of the woody bundles of its radicles. In its chemical reactions also, it closely resembles the root of *Actæa racemosa*, and hence may be thus distinguished also like it, from true black hellebore root. May not the uncertain action of the once celebrated purgative—*black hellebore*—be due, in some degree at least, to this admixture, or substitution of spurious roots?

From the characters thus given of this false hellebore root, it may be seen that it resembles, in all its essential characters, the root of *Actæa racemosa;* indeed, I am by no means satisfied that some of the root now sold in this country as that of *Actæa racemosa*, has not a similar origin with it. It is very necessary, therefore, that we should have some distinctive characters indicated between these two roots. The only characters at present, which I can observe, I place but little dependence upon; but I believe that, the radicles of the false hellebore root (*Actæa spicata*)? have a reddish-brown colour, rather than a blackish or brownish, like those of *Actæa racemosa*. They are also more angular in shape, and generally larger. The cross-like arrangement of their woody bundles is also more distinct. I think, also, that the reactions of solutions of sulphate of copper and chromic acid are *less evident*, and that of solution of chloride of barium *more so*, in an infusion of the false root, than with that of the true. Perhaps some of my readers, who live in the districts where the *Actæa spicata* grows, will furnish me with good authenticated specimens of its dried roots, in order that I may endeavour to set the above questions at rest.

Aconite or monks-hood root may be readily distinguished from cimicifuga by the following characters:—

Cimicifuga.	*Aconite.*
More or less cylindrical in form, twisted, and presenting prominent projections, and transverse ridges on its surface.	Conical in form, not evidently twisted, and without projections and transverse ridges on its surface.
Radicles, presenting a cruciate, or radiate arrangement of their woody bundles.	Radicles not presenting a cruciate, or evidently radiate arrangement of their woody bundles.
Odour evidently narcotic when freshly dried.	Odour but very feebly narcotic.
Taste very bitter, and not followed by tingling and numbness.	Taste bitter, and succeeded by tingling and numbness.
An infusion is but slightly reddened by tincture of litmus.	An infusion becomes bright red on the addition of tincture of litmus.
Solution of chromic acid produces a dark colour, and a slight brownish-black precipitate in infusion of cimicifuga.	Solution of chromic acid produces no perceptible change in infusion of aconite.
Solution of chloride of lime deepens the colour of infusion of cimicifuga, and forms a brownish precipitate.	Solution of chloride of lime destroys the colour of infusion of aconite, and forms a whitish floating precipitate.

Action and Uses.—The consideration of the action and uses of cimicifuga does not come especially within my province. I shall content myself, therefore, by making two quotations upon these points from distinguished medical authors.

The following is taken from Stille's *Therapeutics and Materia Medica*, a valuable American work on the subjects upon which it treats.* He remarks—"Dr. Chapman† says that, 'given so as to affect the system, we find first, some nausea, followed by greater freedom of expectoration and more or less relaxation of the surface, with slight nervous tremors, and vertiginous affections. The pulse, during this state, is considerably lowered, and is apt to remain so for some time.'" This statement is essentially confirmed by Dr. Davis,‡ the most recent writer upon the subject, who says: "In large doses it produces vertigo, dimness of vision, and a depression of the pulse, which continues for some time." In medicinal doses, Dr. Young§ did not find it either to vomit or purge, nor yet to increase the perspiration or the urine, nor did it affect the pulse, but produced only an uneasy feeling amounting to an ache through all the extremities, and lasting from one to four hours. Dr. Davis, like previous observers, could not detect any perceptible increase in any of the secretions, nor the manifestation of any stimulating qualities. On the whole, it seems to present a striking analogy to colchicum in its action. With respect to its uses, Dr. Simpson, of Edinburgh, states that, "The tincture has been long spoken of as a remedy for rheumatism, and particularly in the more acute forms of the disease. Latterly it has been employed by some American physicians as their most valuable remedy in acute rheumatic fever. My very intelligent and excellent friend, Dr. Varis, of Rochelle, New York, told me two years ago that since employing the tincture of actæa in rheumatic fever—and it is a very common disease in his district—he had seen the disease almost always cut short before the eighth or tenth day; the drug acting apparently as a simple antidote to the rheumatic poison, and curing without diuresis, diaphoresis, or any other discharge. I have found it, in my own case, repeatedly cure an attack of lumbago with wonderful rapidity. Some of the American practitioners who have written upon actæa have spoken of its use in terms that are, no doubt, exaggerated. Thus, Dr. Davis, of Chicago, says that, after much experience, he has no more doubt of the efficacy of actæa in the early stage of acute rheumatism, than he has of the power of vaccination as a preventive of small-pox.‖ But our American brethren have used actæa also in chorea and other anomalous forms of nervous disease. However unlike rheumatism and chorea may look to the superficial observer, yet the able investigations of Dr. Begbie and other pathologists have fully shown, that an analogy, if not an identity, exists between the blood-poison which produces rheumatism and that which produces chorea. Dr. Physick, of New York, and Dr. Jesse Young,¶ of Pennsylvania, about thirty or more years ago, recommended actæa strongly in chorea. Latterly, Drs. Lindsey,** Kirkbride,†† Otto, and others, have published their experience in favour of the same drug in this disease. In a case of anomalous and severe chorea of long standing, which was under my care some months ago, the actæa was given with excellent effect. The patient had been previously treated, both in France and in this country, with zinc, iron, arsenic, and all the usual remedies employed in this malady."

Besides the affections mentioned above, cimicifuga has been administered with,

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* Vol. ii., p. 594.

† *Elem. of Therapeutics*, 6th Edit., vol. i., p. 357.

‡ *Trans. Amer. Med. Association*, vol. i., p. 352.

§ *Amer. Journ. of Med. Science*, vol. ix., p. 313.

‖ *Trans. Amer. Med. Association*, vol. i., p. 352; and *Wood's Therapeutics and Pharmacology*, vol. ii., p. 168.

¶ *Amer. Jour. of Med. Science*, vol. ix., p. 310, and vol. xiii., p. 57.

** *Ibid.*, vol. xxiii., p. 254.

†† *Trans. Amer. Med. Association*, vol. xxv., p. 288.

it is said, good effect in the early stages of *phthisis*,* in *chronic bronchial diseases*, in *hysteria*, *nervous headache*, *epilepsy*, *dropsy*, and in certain *uterine disorders*, &c. There can be little doubt, therefore, that if recently dried cimicifuga be administered, it is a medicine of much value, and can scarcely fail to become an important article of our Materia Medica. It has no value as a remedy in snake bites, as its popular name would seem to imply.

Administration and Doses.—Cimicifuga may be administered in substance, or in the form of a tincture, infusion, decoction, or extract. The resinoid principle (*cimicifugin*) is also sometimes given, in doses of from one to two grains. Cimicifugin is described by Dr. King (see *American Eclectic Dispensatory*) as tonic, alterative, nervine, anti-periodic, and as having an especial affinity for the uterus. The narcotic properties of the root are, however, absent. The dose of powdered cimicifuga is from a scruple to a drachm. This may be given in syrup, or simply suspended in water. The most active preparation appears to be the alcoholic tincture, as alcohol is a better solvent of the virtues of the root than water. The infusion and extract are, however, sometimes convenient forms of administration, and a decoction has also been frequently employed, but as the properties of cimicifuga appear to be due, in some degree at least, to a volatile principle, the latter mode of administration is a bad one. The doses of tincture, extract, decoction, and infusion, will necessarily vary, according to the proportion of ingredients used in their preparation. As we have been frequently applied to for formulæ to prepare these, we subjoin those in common use in America, and would urge the desirability of these standard formulæ being adopted in this country, to promote uniformity of strength in the different preparations.

Tincture of Cimicifuga (Wood and Bache).—Black snake-root, bruised, four ounces; diluted alcohol (sp. grav. 0.935), sixteen ounces. Macerate for fourteen days, then press and strain; or proceed by percolation. According to Dr. Wood,† the dose of this should be, from one drachm to half a fluid ounce, three or four times a day, in chronic cases, for adults; and proportionably reduced for children. Dr. Davis‡ gives from thirty to sixty drops in acute rheumatism every two hours, until its effects are manifest upon the system.

Decoction of Cimicifuga (Wood and Bache). — Black snake-root, bruised, one ounce; water sixteen ounces. Boil gently for ten or fifteen minutes in a covered vessel, and strain. *Dose*, one or two fluid ounces. Wood says, that from half a pint to a pint of this decoction may be taken during the twenty-four hours.

Infusion of Cimicifuga.—In the absence of any recognised formula for an infusion, we give the following:—Black snake-root, bruised, two ounces; boiling water, sixteen ounces.

Macerate for two hours in a covered vessel, and strain.

Dose, one to two fluid ounces.

Extract of Cimicifuga.—A *fluid extract* and a *dry extract* have been prepared by Professor Procter. The following is his process for the *fluid extract*. Sixteen ounces of the recently dried root, in powder, are put into a percolator for volatile liquids, and a mixture of sixteen ounces of alcohol and eight ounces of ether is gradually added. After the liquid has ceased to pass, diluted alcohol (sp. grav. 0.935) is poured in until the filtered liquid equals twenty-four ounces, which is set aside in a warm place, and allowed to evaporate spontaneously until reduced to eight ounces. The percolation is continued with diluted alcohol until thirty-two ounces of tincture are obtained, which is evaporated in a water-

* *Amer. Jour. of Med. Science*, Oct., 1842, p. 281.
† *Wood's Therapeutics and Pharmacology*, vol. ii., p. 168.
‡ *Trans. Amer. Med. Association*, vol. i., p. 356.

bath to eight ounces, and then very gradually added to the former liquid so as to avoid precipitation. After a few hours, the mixed liquid is filtered, and brought to the measure of sixteen ounces, if necessary, by the addition of alcohol. The *dry extract* is obtained by preparing the two concentrated tinctures as above, and continuing the evaporation separately till they have the consistence of syrup, when they are to be mixed, and carefully evaporated to dryness by means of a water-bath.* Eight grains of this dry extract represent 3i of the root.

The *dose* of the *fluid extract* is a fluid drachm; and of the *dry extract* from four to eight grains.

According to Dr. Lee,† the powers of cimicifuga, in rheumatic affections, and in dropsy, are greatly increased by administering it in combination with iodide of potassium and ipecacuanha. In dropsy, it is also commonly prescribed in America with laudanum. Some anodyne appears also to be a valuable addition to the tincture, when used in the early stage of phthisis, and in chronic bronchial disease.

FACTS AND FALLACIES CONNECTED WITH THE RESEARCH FOR ARSENIC AND ANTIMONY; WITH SUGGESTIONS FOR A METHOD OF SEPARATING THESE POISONS FROM ORGANIC MATTER.

BY ALFRED S. TAYLOR, M.D., F.R.S.

(*Continued from page* 417.)

DISTILLATION PROCESS FOR ARSENIC—(*Continued*).

Applications of the process.—Including the analyses for arsenic in copper already referred to (p. 316), I have applied this process during the last year in probably not less than seventy instances. In cases in which negative results were obtained from the distillate, no arsenic was found by Reinsch's process, either in the distillate or in the acid residue in the receiver. The process presents this great advantage to the toxicologist; it may be safely adopted without interfering with the research for other poisons. With the exception of mere traces of antimony and bismuth, that pass by distillation, all other metals remain in the residue after distillation; and with respect to these metals, the greater proportion remains behind. Hence after separating arsenic, the residue may be examined for antimony, mercury, copper, lead, and other metallic poisons, by the ordinary processes. On the other hand, if the presence of any volatile poison, such as alcohol, prussic acid, ether, or chloroform, is suspected, a water-bath distillation, to separate any of these liquids, may be resorted to, before commencing the research for arsenic. A portion of the residue may in all cases be reserved for the research for organic alkaloids.

The subjoined experiments were purposely resorted to, in order to test the efficacy of the process.

1. *The stomach.*—The contents and part of the coats of the stomach of a person had been examined for arsenic by Reinsch's process, and no arsenic was found. The remainder of the stomach had been exposed for some months, and was in a dry state. A solution containing three eighths of a grain of arsenic was poured over the surface; in this state it remained exposed five months longer. One third of it was then cut up and distilled with two ounces of pure hydrochloric acid, in the manner already described (p. 411). The distillate was acid, and nearly colourless. It yielded arsenic readily by Reinsch's process, as well as metallic

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* *Amer. Journ. of Pharm.*, vol. xxvi., p. 107.

† *Amer. Journ. of Mat. Med.*, vol. ii., p. 302.

arsenic from arseniuretted hydrogen,—arsenious acid by the use of nitrate of silver, and arsenic acid by the use of nitric acid. The dry residue in the retort was tested by Reinsch's process. It contained no arsenic. In this experiment, the quantity of arsenic operated on in the substance of the stomach could not have exceeded one eighth part of a grain.

2. *The liver.*—Sixty grains of the dried liver of a person who died about five years since from the effects of arsenic, were broken up and distilled with hydrochloric acid. A slightly coloured, offensive liquid was obtained in the receiver, which yielded arsenic readily by the methods described, in all the forms in which arsenic admits of recognition. The residue in the retort contained no arsenic.

3. *A poisoned lozenge.*—This was an ordinary sugar-lozenge, poisoned with a grain of arsenic. It was distilled with hydrochloric acid. Arsenic was abundantly procured in the distillate, which was of a yellowish-brown colour, arising from the presence of some organic matter. This was not, however, in sufficient quantity to interfere with the subsequent stages of the analysis. The sugar darkened considerably in the retort, and gave much froth. The process of distillation was found to be more troublesome with saccharine than with other kinds of organic matter. A trace of arsenic was detected in the residue in the retort, showing that in this instance, by one distillation, the arsenic had not been entirely separated. The quantity was, however, so small that it was not considered necessary to resort to a second distillation.

4. *Arsenical paper-hangings.*—About half a square inch of a green paper, coated with the aceto-arsenite of copper, gave, on distillation with hydrochloric acid, a clear acid distillate, from which arsenic was readily procured in its usual forms.

5. *River water, containing arsenic.*—This was probably as severe a test as could be selected for the process. Two samples of water, one of two gallons, and the other of one gallon, taken, at an interval of six months, from a pipe supplying an inn in a country town, were respectively evaporated to dryness. Each left a dirty, ochreous-looking deposit, weighing in the larger sample twenty grains, and in the smaller sample thirteen grains. The acid distillates of these residues were successively placed in the small tube-apparatus for generating hydrogen, described at p. 415 ; and a capillary tube was connected by a cork* with the chloride-of-calcium tube. Some lead-paper was also introduced into the mouth of this tube, in order to stop the sulphur. The issuing gas, in each case, blackened paper wetted with the nitrate of silver. It had no effect on lead-paper. A full red heat was applied to the tube just before the spot at which it was drawn out. A well-marked deposit of metallic arsenic was obtained in the cool and contracted part of the glass tube. This was estimated by comparative experiments at about 1-250th part of a grain in a gallon of each water. The quantity was so small that no other test could be resorted to, excepting the process of Reinsch, which gave a clear arsenical deposit on a small piece of polished copper. The metallic deposit in the capillary tube had the appearance and entire volatility of arsenic.

The amount of arsenic here found, represented about one grain in two hundred and fifty gallons of water.†

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* I have found in these researches, that when vulcanized rubber is made the medium of connexion for the glass tubes, some sulphur is invariably carried over.

† Samples of water taken, at or about the same dates, from the same pipe were examined by Dr. Miller and Dr. Lyon Playfair. The result was, that these gentlemen, acting independently, and employing entirely different methods of research, also found arsenic in this water. In their opinion, the arsenic proceeded from the refuse of certain chemical works on the stream; but as the dried mud of the stream yielded only four tenths of a grain to a pound, and arsenic was found in the mud of the stream above all chemical works, it was, in the opinion of Mr. Campbell

6. *Sediment of a river.*—Two ounces of a sandy sediment collected from the bed of a small stream in Derbyshire—above any position from which arsenic could find its way into it from any artificial source—were mixed with hydrochloric acid and distilled. The acid distillate was perfectly clear and colourless. It yielded a well-marked quantity of metallic arsenic, when tested in the tube-apparatus, as also by Reinsch's process. In another sample, procured from the same spot, which had been distilled by Mr. Dugald Campbell, arsenic was also found, with traces apparently of antimony.

7. *Thames water.*—Considering the above results as rather remarkable, and to a certain extent confirmatory of the opinion that arsenic is pretty widely distributed through soils in which pyrites or ochreous compounds are found, I examined the dry residue of a gallon of Thames water by the distillation process, and found therein, besides sulphur, a trace of a substance resembling metallic arsenic. It would require, probably, the residue of several gallons to determine the question distinctly.

8. *Mud or sediment from the Thames.*—Some of this mud was collected at low water, on the west side of London Bridge. It was taken partly from the surface, and from a few inches in depth. Two ounces of the mud in a dry state, the water (forming 34 per cent.) having been expelled in a water-bath, were distilled with two ounces of pure hydrochloric acid. One ounce of a clear and colourless acid liquid was obtained in the receiver. It was placed in the tube-apparatus with zinc, and the gas being previously dried, and deprived of any sulphur, was passed into a solution of nitrate of silver. After a short time, there was a dark metallic deposit of the usual black precipitate, indicative of the presence of arsenic; and on applying heat to the current, a deposit of metallic arsenic was procured, which was estimated at not less than the 1-2000th of a grain. I am informed that, during the last summer, no chemical liquids have been introduced into the river for the purpose of deodorizing it; hence, the presence of arsenic in the mud cannot be ascribed to the poisoning of the water by the use of arsenical chloride of iron. The arsenic must be derived either from factories on the banks of the river, or from the arsenic naturally diffused through soils containing oxide of iron.

In these instances, it may be remarked, the arsenic was in an insoluble form.*

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and myself, an impurity which might be explained by reference to natural causes. The Wiesbaden water contains a larger proportion of arsenic per gallon; and there are no chemical works to account for its presence there.

In the "Chemical News" for August 25, 1860, p. 127, Mr. Church has published the results of some experiments on the water of the river Whitbeck, in Cumberland. The water was alkaline, and when analyzed yielded distinct indications of the presence of arsenic. The arsenic existed as arsenite,—not as a mere trace, but in determinable quantity. In some seasons of the year, the proportion approaches a good fraction of a grain of arsenic (metallic) in a gallon of water. The locality from which the stream takes its origin is rich in minerals. Mr. Church found there arsenical cobalt, and from this the arsenic is probably derived. The arsenical water is habitually used for every purpose by the inhabitants of the village of Whitbeck, and with beneficial rather than injurious results. This appears to show clearly that river water may be arsenical wholly independently of chemical works on the banks.

* It is now well known that a large number of mineral waters in France and Germany contain arsenic. In the "Annuaire de Chimie" for 1849, p. 277, there is a list of forty mineral waters, including six of the well-known Vichy waters, which contain arsenic. Those of the Upper and Lower Rhine also contain this substance. (See "Annuaire," 1848, pp. 189 to 194.) The waters of the Baths of Alexis, on the Hartz, evidently derive the arsenic from arsenical pyrites in the soil. According to Dr. Hofmann, the Wiesbaden water, which is generally considered a wholesome water, contains one grain of white arsenic in a hundred and sixty-six gallons. ("Chemical News," August 11, 1860, p. 101.) This is a larger proportion than that found in the water supplied to a country town above referred to (p. 53). The mud or ochreous sediment of these waters also contains it. ("Annuaire de Chimie," 1848, pp. 189-194.) It is probable if the sediment of most of our rivers was examined, arsenic would be frequently found therein as a

9. *Metals and metallic salts.*—The detection of arsenic in such metals as copper, iron, or lead, is effected by distillation with hydrochloric acid, after their conversion to chlorides. This method has been already fully described in reference to copper (p. 376). In July and August, 1859, I first employed it for the detection of arsenic in sulphate and insoluble oxychloride and arsenite of copper, as well as in chloride of tin, the subnitrate of bismuth, and grey powder. In ten grains of the sulphate of copper supplied from the shop of a medical practitioner arsenic was found. It was detected in some of the green incrustation derived from the action of chloride of sodium on metallic copper, showing that, in some forms of cupreous poisoning, arsenic is certainly present. Scheele's green, in all its varieties, whether on paper-hangings or in confectionery, yields arsenic by distillation in great abundance. Out of five samples of bismuth, supplied by respectable druggists, arsenic was found in three; and out of as many samples of grey powder, arsenic was found, and that only doubtfully, in one.

I have lately employed this process on a large scale, in the examination of the viscera of three persons whose bodies were exhumed after from six to nine months' burial, and of the viscera of two persons recently deceased. The results were negative for arsenic. Antimony was found in four of the bodies; but no trace of this metal was procurable by distillation with hydrochloric acid. When large quantities of viscera are used, a capacious retort or flask must be employed. Arsenic, when present in large quantity, may be obtained by the distillation of viscera in their ordinary state with strong hydrochloric acid. I find, however, that it is much better to reduce the bulk and expel the water by drying the substance cut in slices, and by exposing them to a free current of air. The operator can then not only deal conveniently with more matter in one analysis, but he is more certain of obtaining the arsenic in the form of pure chloride in the distillate. The dried viscera, finely cut up, should be allowed to digest for a few hours without heat in the closed retort or flask in which they are to be distilled. This breaks up the structure, and renders distillation easy. It will be understood in the application of this process, that it may be sometimes necessary to redistil the distillate, if coloured, in order to separate organic matter, and at other times, the residue in the retort may require a second distillation with strong hydrochloric acid. In all cases, the residue in the retort should be tested by Reinsch's process, in order to determine whether any arsenic is retained in it. By adding to one portion of the residue, chlorate of potash and a little hydrochloric acid, and boiling the mixture, the organic matter may be destroyed; any arsenic converted to arseniate of potash, and the clear filtered liquid tested by Marsh's process.

In the distillation of recent and undried viscera, most offensive products, including sulphur-compounds, are evolved. These are decomposed if the distillate is kept for a few days, and sulphur is deposited. If tested immediately with the hydrogen apparatus, sulphuretted hydrogen is evolved. This may be stopped by a salt of lead, in the manner already described at p. 415. If the hydrogen compounds of sulphur and arsenic pass over together, the application of a red heat leads to the production of an orange-yellow sulphide of arsenic at the end of the metallic deposit. Sulphur alone can never be mistaken for metallic arsenic. Its yellow colour, its property of readily melting, and the absence of any solid product as a result of the action of nitric acid,—are characters which will prevent any mistake on this ground.

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natural constituent. This method of analysis will be found convenient for detecting arsenic in waters. An acid salt of iron is always produced during the distillation, but, with ordinary care, this does not pass over with chloride of arsenic so as to affect the subsequent steps of the process.

Novelty of the process.—The reader will have perceived from the foregoing remarks, that the process here recommended has no pretensions to novelty. It consists simply in the association or arrangement of the well-known chemical properties of arsenic so as to render them more easily demonstrable than they have hitherto been. The processes of Marsh and Reinsch have been introduced in a form less objectionable than that in which they were left by their discoverers.

The chloride of arsenic has been long known as a volatile compound. Berzelius, and chemical writers subsequently to him, describe its properties, and refer chiefly to one method of preparing it; namely, by distilling at a high temperature a mixture of arsenious acid and corrosive sublimate. In 1841, Dupasquier found that arsenious acid was very soluble in hydrochloric acid, and he considered the solution to contain chloride of arsenic. When submitted to distillation, he found the distilled product to be arseniferous.* Dr. Pereira states that on repeating the experiment, he found the quantity of arsenic which distilled over was very small, and that the residual liquor in the retort deposited octahedral crystals of arsenious acid.

In employing Reinsch's process in various analyses for arsenic in the dead body, during the years 1846-7, I found that there was a loss of arsenic; and the following passage in reference to this subject occurs in the first edition of my work "On Poisons:"—"The boiling of the tissues in muriatic acid for the extraction of arsenic should take place in a *close vessel;* such as an alembic or a capacious retort with a receiver attached to it. There is, beyond all doubt, a loss of arsenic when this precaution is not adopted. In May, 1847, the following experiment was performed in order to determine this point. Four grains of arsenious acid were dissolved in five ounces of distilled water, to which five drachms of concentrated muriatic acid had been previously added. The vessel was so large as to prevent the possibility of any liquid being carried over *mechanically.* The boiling was continued for two hours, when nearly one half of the liquid had been collected in the receiver. This was found to contain arsenic on applying Reinsch's process."†

I have at intervals, since this time, continued the practice of boiling the tissues in a retort and analyzing the distillate, whenever a suspicion existed that arsenic was present, but in very small quantity; and when Reinsch's process did not at once indicate the presence of the poison.

The fact, therefore, that arsenic could be procured from the tissues by distillation with hydrochloric acid, has been known and acted on for the last fourteen years. The facilities presented by Reinsch's process, had rendered it unnecessary to resort to distillation in most cases, as the presence of organic matter did not interfere with its operation.

In 1849-50, I find, from notes in my possession, that my friend and colleague, the late Mr. Arthur Aikin, laid before the classes of Guy's Hospital, and demonstrated, the method of procuring chloride of arsenic by the use of salt and sulphuric acid. The note is to the following effect:—

"If one part, by weight, of arsenious acid, three parts of common salt and four parts of strong sulphuric acid, are mixed and distilled, there comes over a thick, oily liquid, formerly called butter or oil of arsenic, which is hydrated terchloride ($As\,Cl_3 + 3HO$)." MSS. lectures. In 1851-2, Dr. Schneider proposed a mixture of salt and sulphuric acid for procuring arsenic from organic matter, and it

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* Quoted by Pereira from "Journal de Pharmacie," tome xxvii., p. 717, 1841. Pereira, Elements of Materia Medica, &c., by Taylor and Recs, 1854, p. 720.

† "On Poisons in relation to Medical Jurisprudence and Medicine," 1st edition, 1848, p. 363.

succeeded more perfectly than he had anticipated, considering that the anhydrous chloride of arsenic does not boil under 270°.*

Schneider advises that the salt and acid should be accurately tested before use, so as to ascertain that they are free from arsenic. He gives a number of minute precautions, and a form of apparatus, for an account of which I must refer the reader to his work. The common salt should always be in large excess, in order to prevent the production of sulphurous acid by a reaction towards the close of the distillation, between the organic matter and sulphuric acid. He found that when arsenious acid was dissolved in a large excess of hydrochloric acid and distilled, the whole of the arsenic went over as the chloride mixed with the vapour of the acid; not a trace of arsenic remained in the retort. Thus he found it impossible to purify by distillation hydrochloric acid, rendered impure by arsenic, or even liquids of which hydrochloric acid was a large constituent. He pointed out the fact, that in most researches for arsenic, the volatile chloride may be produced; and if in small quantity, the poison may be entirely lost, and a negative result obtained, when, with greater care, the presence of the poison would have been detected.†

Having given to this method a fair trial, I find it far inferior to that which I have above recommended. In mixing the salt and acid there is great frothing, with a large escape of vapour. In some cases in which pure hydrochloric acid operates effectually, this process will not detect arsenic. This occurs in reference to arsenic in metallic copper, and in certain metallic salts. Schneider states, that the sulphide of arsenic is readily converted to the chloride by this process, provided a larger quantity of salt and acid is used, and the distillation maintained for a longer time. The further steps of the process, as described by Schneider, are as follows:—The distillate containing chloride of arsenic is placed in a Marsh's tube; the resulting gas is decomposed by heat, so as to produce an arsenical mirror, and another portion is allowed to pass into a solution of nitrate of silver, in order to procure a solution of arsenious acid, to which the usual tests may be applied.

As a result of some recent investigations, it has been found that an excess of sulphuric acid prevents the formation of chloride of arsenic. In fact, the chloride when treated with concentrated sulphuric acid, is decomposed into hydrochloric and arsenious acids, the latter of which remains behind in the retort.‡ Hence, unless care be taken respecting the proportions used, the object of the process will be entirely defeated. On one point the results of my experiments are quite in accordance with those of Schneider. If the distillation is carefully and properly conducted, and carried on for a sufficient time, the whole of the arsenic contained in the organic matter will be transferred to the distillate.§

Schneider's process has been largely employed in Germany, but it has been little used in this country. A description of it was published in the *Pharmaceutical Journal* for July, 1853, p. 38. About this date Dr. Clark, of Aberdeen, took up the subject, and, as I am informed, employed the process successfully in some medico-legal investigations for arsenic. In the fifth edition of my "Medical Jurisprudence," 1854, I briefly referred to it, stating that the arsenic contained in organic liquids or solids might be procured as chloride, in a receiver, by distilling the organic matter with a mixture of common salt and sulphuric acid; and, further, that the chloride of arsenic thus obtained in a pure state might be subsequently analyzed by any of the usual processes.

* "Die Gerichtliche Chemie für Gerichtsärtze und Juristen," bearbeitet von Dr. F. C. Schneider, Docenten der Chemie an der Wiener Universität. Vienna, 1852, pp. 193, 206.
† Op. cit., 194.
‡ "Archiv. der Pharm.," and "Chemical News," June 23, 1860, p. 24.
§ Op. cit., p. 207.

According to Dr. Christison, the process of extracting arsenic by distilling the viscera with hydrochloric acid, was employed by Dr. Penny, of Glasgow, in 1852. In the case of Madeleine Smith (1857), both Dr. Christison and Dr. Penny obtained arsenic by the distillation of the viscera of the deceased L'Angelier with hydrochloric acid—the one from the liver, and the other from the fluid contents of the stomach. Dr. Christison's mode of operating is thus described in his evidence:—"About four ounces of the liver were subjected to a modification, proposed in 1852 by Dr. Penny, of the process of Reinsch for detecting arsenic in such matter. The liver having been cut into small pieces, and boiled in hydrochloric acid and distilled water, in a glass flask, to which a distilling apparatus of glass was connected, the whole texture was gradually reduced to a fine pulp, and a distilled liquor was obtained which was collected in divided portions. These liquors were colourless and nearly clear. The first two portions obtained did not contain any arsenic;* the third gave faint traces of it; the fifth and sixth portions, when separately subjected to the action of copper-gauze, gave characteristically the usual dark grey incrustation, and this again was driven off as usual by heat in a small glass tube, and yielded in each case a white, sparkling ring of crystals, which were regular octahedra, or forms derived from the octahedron. The liver, therefore, contained arsenic."† Dr. Penny states, "A fourth portion of the prepared fluid (contents of the stomach) being properly acidified with hydrochloric acid, was distilled, and the distillate subjected to Fleitman's process. For this purpose it was boiled with zinc, and a strong solution of caustic potash. Arseniuretted hydrogen was disengaged, and was recognized by its odour as well as by its characteristic action on nitrate of silver.‡

It appears that, in the above cases, the acid employed in the distillation was used in a diluted state, as it was employed by myself in 1846-7. This was, no doubt, the cause of the arsenic not coming over entirely. Dr. Christison simply applied Reinsch's process to the distillate; and Dr. Penny, although he might have obtained arseniuretted hydrogen by the use of zinc alone, added a strong solution of potash. The only tests to which the gas thus procured was submitted, were the peculiar odour and the action of nitrate of silver.

In the "Guy's Hospital Reports" for 1855,§ Dr. Odling has published the account of an experiment which, at the suggestion of the late Mr. Scanlan, he performed on the stomach of a dog. He distilled it to dryness with hydrochloric acid. Arsenic was very abundantly detected in the distillate, and the residuum was not by any means free from the poison. Altogether, the process did not present any advantages to compensate for the increased trouble attending it. Subsequent experience has, however, satisfied him that he had here undervalued this method of separating arsenic.

This, I believe, comprises all that is recorded in English medical literature, or that has been done by English chemists in reference to the method of separating arsenic by hydrochloric acid, up to the summer of 1859. It was at this time that the objections taken to Reinsch's process induced me to revise the facts already known regarding the action of hydrochloric acid on arsenic, and the conditions

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* No chloride was produced until some water had been expelled.

† Irvine's "Report of the Trial of Madeleine Smith," 1857, p. 61. It would thus appear that the use of Reinsch's process with copper-gauze untested in its substance for arsenic, was employed by this excellent chemist and toxicologist up to the summer of 1857 for the detection of arsenic in a liver, in a case of alleged murder by poison, and with perfect safety as to the results.

‡ Op. cit., p. 54.

§ Third Series, vol. i., p. 293, 1855. In the last volume of these "Reports" for October, 1859, the experiment is again referred to at pp. 370 and 371, but by a typographical error the year is set down in both references as 1851, instead of 1855.

under which the acid might be used for the separation of this poison from organic matter. During the last twelve months I have made many experiments on this subject, the results of which are here given. In addition to the other well-known properties of arseniuretted hydrogen, for which science is indebted to the researches of Gay Lussac and Soubeiran, I have found that the use of strong nitric acid for oxidizing the gas is a useful addition to this branch of medico-legal research, a fact which appears to have been hitherto overlooked.

(*To be Continued.*)

DETECTION OF ARSENIC, &c.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—Throughout Dr. Taylor's paper on the detection of arsenic and antimony, now being published in the *Pharmaceutical Journal*, he refers frequently to investigations made by me, either alone or in conjunction with him. Under any circumstances, I should consider that Dr. Taylor had taken a great liberty in describing my unpublished views and experiments, whether independent or conjoint, without first consulting me on the subject; but with still greater reason do I complain when, as in the present instance, he has indulged largely in misrepresentation, not merely by suppressing some points and modifying others, but also by attributing to me, in more or less distinct terms, processes which I never performed, and opinions which I never entertained.

With regard to the mistake made in the examination of the chlorate of potash mixture, it was a blunder which, in my opinion, is utterly indefensible. I am heartily sorry for my share in it, which, however, is much less than what the public have been led to suppose. For when Dr. Taylor, in his evidence at the trial, said, more than once, that I had made an independent examination of the liquid, and had independently detected arsenic in it, he stated what was altogether untrue. I have in my possession a letter from him, in which, though he does not offer to retract his statement, he admits that it was incorrect, and that the only experiment in which I bore any part was a conjoint one, which, I may add, was made after he had come to the conclusion that arsenic existed in the mixture. When I subsequently wished to confirm the result of that experiment by a process of my own devising—the one, in fact, by which the residue of liquid was at last satisfactorily tested, but of which no mention is made in Dr. Taylor's paper—he declined to allow me, alleging, what I admit was a substantial reason, that he could not spare any of the very small quantity of liquid then remaining.

I may say also, that the correction of the error was not in any way due to Dr. Taylor, but solely to me, inasmuch as I first detected, when experimenting in my own laboratory, the presence of arsenic in the copper gauze which was employed in the investigation. I have by me a letter of Dr. Taylor's, written at the time, in which, referring to my experiments, he intimates that I must be mistaken in supposing his copper gauze to be impure, seeing that he had submitted it to another chemist, mentioned by name, who had confirmed him in his opinion of its purity. Eventually, however, he became satisfied of the accuracy of my results.

As an illustration of Dr. Taylor's want of candour, I quote the following passage from his paper. In reference to the process of distillation with hydrochloric acid, my prior publication of which in all its details he has thought fit to suppress, he writes: "I had in vain sought for evidence of arsenic in some sulphate of copper, but on distilling only ten grains of the crystals with hydrochloric acid, chloride of arsenic was obtained in the receiver, and the presence of arsenic was satisfactorily proved." The facts of the case are, that Dr. Taylor

examined some sulphate of copper, and reported to the solicitor for the prosecution that it was pure. Subsequently, when I became engaged in the case, I re-examined the salt, and detected arsenic in it, not only by distillation with hydrochloric acid, but by precipitating from its aqueous solution a basic arsenite of copper, which yielded arsenious acid on sublimation. Then Dr. Taylor, after consultation with me, employed the hydrochloric acid process in a conjoint experiment, and admitted his previous error.

As I hope shortly to publish a detailed memoir on the detection of arsenic and antimony, I do not care to enter into further particulars now, but content myself with disavowing any complicity in Dr. Taylor's production, which, in very many of its parts, relating both to antimony and arsenic, is most unjust to me. I am, Sir, your obedient servant,

Kennington Road, Feb. 23*rd*, 1861. WILLIAM ODLING, M.B., F.R.S.

REPORT OF THE

RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION,

AND OF THE

APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

Chemical Examination of the Latex and of the Cambium.—M. E. Fremy, who by his brilliant and elaborate investigations has contributed so much to our knowledge of the composition and constitution of the immediate principles which form the tissues of plants, has presented to the French Academy the results of an investigation into the composition of the so-called *Latex*, or elaborated and descending sap. We appear to possess scarcely any definite knowledge of the nature or functions of this liquid. Botanists have not determined in a precise manner the nature of the channels in which it is contained. Some conceiving that this liquid exists only in particular vessels, which they designate under the name of *Laticiferous vessels*; others admitting that the woody fibres form part of the laticiferous system, and consequently contain latex. Even quite lately M. Trecul has admitted the existence of latex in all vessels—spiral, reticulated, radiated, and punctated.

The author, moreover, conceives that, from the difficulty of obtaining this liquid in a definite and unmixed state, fluids have been obtained, and designated by the name of latex, which are essentially different. All liquids, in fact, which are not sap, being termed latex, and the vegetable excretions thus confounded with the true organizing fluid.

The object of M. Fremy's experiments was to ascertain whether there existed in the active parts of the vegetable organization, and to be found in all plants, a truly organizing liquid, resembling in composition the organs which are in process of formation, and comparable, to a certain extent, by its constancy of composition, and by its functions, to the albumen of the egg, or the serum of the blood. Such a fluid, M. Fremy states he has found. He names it the albuminous latex.

It is obtained by making a slight incision into the tissue situated beneath the epiderm, which is apparently in process of formation. The albuminous latex escapes in an almost pure state when we are fortunate enough to cut the laticiferous vessels gorged with juice, while the other tissues which are wounded by the incision are formed of narrow cells retaining their liquid. In all cases, the first drop must be collected separately, because the second does not always present the same characters. The liquids so obtained from various plants, and from different parts, all possess the same chemical characters. The author operated upon the petioles of the *Colocasia odora* and the Banana, on the stems of the *Stephanotis* and the *Tanghinia*, on the roots of the Arum, and the Parenchyma of the Toadstool. The liquids thus variously obtained presented the following properties:—When heated, they were converted into a white mass, like the albumen of egg, or the serum of blood. They were equally

coagulated by a trace of nitric acid or of tannin. In these experiments it is not the albuminous turbidity which is observed in all vegetable juices on boiling them, but a true solidification of the liquid that is determined. This albuminous secretion commonly presents the alkalinity of serum or egg albumen. The author was enabled to obtain from the Parenchyma of the Toadstool a sufficient quantity of albuminous latex to enable him to determine the amount of albumen in this juice. He found that by evaporation he obtained a residue amounting to thirteen per cent. of the weight of the fluid, and consisting almost entirely of albumen. The serum of blood, therefore, is not more albuminous than this vegetable juice.

This albuminous latex often possesses a very curious property, which merits attention. When it has been extracted from the laticiferous vessels, and preserved in the air for some time, it may undergo a true coagulation, and form a species of membrane. This coagulation often forms upon the edge of the wound which has been made in the plant, and prevents the flow of the liquid. It might be thought at first that the juice contained a fibrinous substance, which underwent solidification after the manner of the fibrin of blood; the author, however, has ascertained that this is not the case, but that it is due to a simple chemical reaction. The tissues which border the laticiferous vessels, contain and secrete in abundance astringent principles, which have the property of gelatinizing all albuminous liquids. That this is the true explanation, was shown by various direct experiments:—thus, by pouring an albuminous solution upon a utricular tissue covered with gelatinous latex, a membranous deposit was produced in a few instants, comparable in every respect to the coagulated latex. When an albuminous latex did not coagulate, the result was attained by adding a trace of an astringent body. Lastly, an astringent matter was always isolated from a latex which coagulated on escaping from the laticiferous vessels. Then the coagulation of the latex arises from the modification which is effected in albuminous bodies by the tannin which is found in the organic tissues, or in the liquid which fills the cells.

This production of gelatinous matter at the expense of the latex, naturally led the author to the study of that jelly which has so much occupied the attention of botanists, and which chemists know so imperfectly—namely, the *Cambium*. From the fear of badly interpreting the opinions of botanists upon the nature of this substance, M. Fremy quotes several sentences from the work of Jussieu:—

"According to M. Schleiden, the first state of the cellular tissue is always that of a gummy solution, which afterwards thickens into a jelly.

"According to Mirbel, wherever a tissue commences to form, the cambium is found; it is, at first, a liquid of mucilaginous consistence, which gradually thickens into a jelly.

"The ingenious experiments of Duhamel on the formation of wood in dicotyledonous trees, lead to the idea that the cambium is formed at the expense of the more elaborated juices. In seeking where the cambium, the element, or the first outline of all vegetable organization, is deposited, one remarks that it is generally on the track of the laticifers."

M. Fremy then states:—Now I have demonstrated that these vessels (laticiferous) almost always carry a very albuminous juice, which gelatinizes by the action of the astringent liquids and tissues; these facts appear to explain in a satisfactory manner the production of gelatinous cambium.*

I know not if botanists admit now that vegetable membrane passes through a gelatinous state before being organized, and if it is permitted to the observer to thus seize the starting-point (*l'ébauche*) of organization; in any case the chemist should make known the properties of the immediate principles which are concerned in these mysterious phenomena.

The principal object of this communication is, then, to prove that the elaborated and descending sap is probably a mixture of several different liquids, one part containing the vegetable excretions, the other serving to organization. It is thus that one can chiefly explain the differences observed in the composition of the juices proper.

* These observations agree with those of M. Payen, who proved that the primary membrane of a tissue in course of formation are always strongly nitrogenous.

To determine the part that these juices take in the vegetable organization, these two species of organic liquids should be studied separately.

These experiments will direct the attention of botanists to a liquid as albuminous as the serum of blood, which is found in freshly forming tissues, and which has been extracted from various plants and vegetables. It remains to ascertain if the albuminous latex is a vegetable juice which occurs only exceptionally, or if it is really concerned, as the author believes, in the development of all tissues. M. Fremy is still engaged on this question.

On the Sugar present in Acid Fruits.—M. H. Buignet has communicated to the French Academy the result of some researches on the saccharine matter contained in acid fruits, its origin, its nature, and its transformation. M. Buignet states that the sugar which is primarily formed in acid fruits is cane sugar ($C_{12}H_{11}O_{11}$). During the process of ripening this sugar is gradually changed into interverted sugar ($C_{12}H_{12}O_{12}$), but very often there remains in the ripe fruit a mixture of these two sugars. The cause of this change is not, as might be thought, the acidity of the fruit; but it appears to depend on the influence of a nitrogenous body playing the part of a glucosic ferment, analogous to that which M. Berthelot has extracted from yeast. The separation of the cane sugar from the interverted sugar is effected with difficulty. The process which answers best is that which M. Peligot has described for the analysis of molasses, and which consists in forming a sucrate of lime, which is separated by boiling and afterwards decomposed.

The abundance in which starch is found distributed through the vegetable kingdom, leads to the supposition that it is the true source of the saccharine matter in fruits. Its presence cannot, however, be detected in green fruits either by the microscope or by iodine, excepting in green bananas, which contain a notable proportion of starch.

There exists in green fruits a particular principle resembling the tannins, which possesses the power of absorbing iodine with greater energy than starch. Its proportion diminishes in the same ratio that the proportion of sugar increases. If we collect the compound of this astringent matter with iodine, we can effect its transformation into sugar under the influence of dilute acids and a proper temperature. The sugar which this tannin furnishes is dextrogyre and identical with the sugar from starch. This tannin then affords no more satisfactory explanation than starch does, of the origin of sugar in fruits, because the sugar of acid fruits is cane sugar partially or entirely interverted.

Saponification of the Fats by Anhydrous Carbonates.—M. Scheurer-Kestner indicates that when the anhydrous carbonates of the alkaline metals are heated with the fats to a temperature of 260° C., their carbonic acid is liberated in the free state, and the metallic oxide combines with the fatty acid to form a veritable soap. Soda, lime, baryta, strontia, and magnesia soaps may be so obtained. If the heat be properly regulated the oxide of glycerile alone is decomposed, and the fatty acids remain intact. One hundred parts of suet furnish 94.8 to 95.6 of fatty acids. The oxide of glycerile undergoes in this reaction a more complete decomposition than occurs during saponification by anhydrous oxides. M. Pelouze found a portion of glycerine among the products in the latter case. In saponifying by anhydrous carbonates no glycerine is formed, but there is disengaged a little acrolein, and a considerable quantity of inflammable gases. The gaseous products of the reaction consist of carbonic acid, marsh gas, and free hydrogen.

ON THE PROXIMATE ANALYSIS OF PLANTS AND VEGETABLE SUBSTANCES.

BY FREDERICK ROCHLEDER, M.D.

(*Continued from page* 429.)

§ 6.—*Quantitative estimation of the constituents.*

For the completion of a work on the analysis of vegetable substances, it is appropriate to describe the methods which are employed to determine the quantities

of individual constituents which have been found in a plant or in a part of a plant. It is often of importance in pharmaceutical or technical relations to know correctly the quantity of one or more constituents of a vegetable substance, or seldomer those of a whole plant. Instruction for the complete *quantitative* analysis of a vegetable substance cannot be given at the present time, as scarcely a complete *qualitative* analysis of any one plant, or part of a plant, exists. It is self-evident that it is impossible to describe methods for the separation of bodies which are unknown, whose proportions of solubility are quite as unknown as their combinations, and of whose existence we know nothing. With vegetable substances also which contain only known bodies, a method for their quantitative determination cannot be supplied, because the bodies most known are still too little investigated with exactness as to afford grounds for the construction of a method of separation from a knowledge of their properties, and the properties of their compounds. Another circumstance renders a quantitative estimation almost impossible, even when we know the means of separating the constituents from one another; namely, a complete exhaustion of a vegetable substance under examination is almost impracticable, because it is not possible to comminute a substance in such a way that each cell is broken and its contents exposed to the action of a fluid. There also always remains behind a quantity—sometimes greater, sometimes smaller—of the constituent to be estimated in the material under examination. It may be easily determined by an experiment how much quinine can be *extracted* from a sample of cinchona bark, while the difficulties of the experiment would be considerably increased to determine how much quinine is *contained* in such sample of bark, as a little quinine always remains in the bark. I believe that it is quite useless to give the methods here which have been devised to determine quantitatively one or the other constituent in a certain vegetable substance; for example, the starch in seeds or bulbs, the sugar of beetroot, the quinine in cinchona bark, &c. To conduct a quantitative analysis, a complete qualitative analysis must first be undertaken, and the individual constituents must be accurately studied, and not only must their relations to solubility and their combinations be known, but their decomposition products, the properties of the same, and the quantity in which they appear, &c., must have been correctly studied. In a particular case, a method for the quantitative analysis of an individual part of a certain plant may be devised when the troublesome and tedious labour above mentioned has been performed in that particular case. But it is not possible to supply a general method for this purpose, because a single body previously unknown, when present with other well-known constituents, must always cause an alteration in the entire order of the analysis. The majority of quantitative analyses, of which we have no deficiency, are regarded as useless. They can only claim to be considered as qualitative analyses. Independently of pharmaceutical or technical bearings, which in particular instances may render desirable an approximately correct quantitative determination of one or the other constituent of a certain material, an exact quantitative analysis can only have for its object the construction of a true representation of the normal constitution of the parts of a plant. But this object has never been accomplished by an analysis, however correct. We are far from being in a position, from a dismembered analysis of an ash, to draw a valid conclusion on the normal soil constituents of a plant, and quite as far from being able, from the individual analyses which have been performed with especial reference to its organic constituents, to form a conclusion on the normal composition of a plant or one of its parts. In such analyses, whether we find ten or thirty per cent. of sugar, is of no importance. We only learn by this estimation that ten or thirty per cent. of sugar are contained in a certain part of a certain plant under certain circumstances, but we do not learn whether this quantity of sugar remains constant under all conditions; or whether the quantity found is the maximum or minimum quantity of sugar, or whether it lies between both extremes. That which has been stated with regard to sugar is applicable to every other constituent. Whether with the increase of one constituent the quantities of a second and a third increase or diminish, this and the like are questions which remain unanswered. Quantitative analyses will only then afford us information—that is to say, will be able to teach us the normal constitution of a vegetable substance—when they have been

performed, in greater number, with materials which have been collected from plants at certain epochs of their development, and from plants which, under various climatic relations, have been developed in various positions, and from plants whose age we know correctly, &c.

These investigations, which are necessary to afford information on the normal constitution of a single vegetable structure, would claim the industry of a chemist for years. Consequently, there is little prospect existing that we shall be in possession of the results of such investigations in our time.

On the grounds just explained, we have also no rule for judging of the correctness or incorrectness of the results of quantitative analyses, when several of them have been performed on one and the same material by several chemists, and when the quantities of the different constituents in the various analyses differ considerably. Individual exact quantitative analyses, consequently, in the proportion to the time and labour bestowed upon them, are of such little service, that it is advisable to neglect them. Under some circumstances the quantitative estimation of a constituent in a material may appear constantly necessary, to determine accordingly its value as a medicine or an article of commerce. Estimations of that kind of constituent, with the neglect of all others, possess proportionately little difficulty, and the corresponding method may be easily devised when a good qualitative analysis lies before us.

With regard to these quantitative estimations of individual constituents, attention may be here directed to circumstances of particular importance. The knowledge of the constituents of a material to be examined teaches us frequently that it is quite impossible to separate two constituents from one another in such a manner that one of them can be obtained pure without any loss. In such cases, or also when the separation can only be accomplished by tedious operations, the possibility of the *indirect estimation of a constituent* deserves our attention. This method for the estimation of a constituent is by no means new. For a long time we have known how to estimate the contents of sugar from the quantity of alcohol which is obtained by the fermentation of the sugar. We have had processes for the estimation of starch from the quantity of sugar which can be produced from starch by various agents. Indirect estimations of this kind are often very easily performed in cases where a direct determination is endlessly difficult or quite impossible. To estimate the quantity of caincic acid in the roots of *Chiococca racemosa* belongs to the impossible: the caffeo-tannic acid cannot be so exactly separated from the caincic acid that the latter is obtained pure without loss. The caffeo-tannic acid mixed in its watery solution with hydrochloric acid and heated, does not give an insoluble or difficultly soluble decomposition product, but simply caincic acid. When a mixture of both substances is treated in the heat with dilute hydrochloric acid, the decomposition product of caincic acid is easily obtained, and its quantity can be estimated. This product is very difficultly soluble, but not insoluble, in the fluid from which it has separated. We know, by the examination which has been made, how much per cent. of the difficultly-soluble decomposition product is afforded by the pure caincic acid, and we know the solubility of this decomposition product as well as the quantity of fluid, consequently know the quantity of the decomposition product which remains dissolved therein; and thus we can estimate, in a short time, the quantity of caincic acid with the greatest facility and exactness. Indirect determinations of that kind may be performed, in a number of cases, without any difficulty and in a very short time. The correction first employed by Fresenius in mineral analysis for the solubility of difficultly-soluble precipitates must not be passed over here without attention being drawn to it.

Microscopic Examination with the aid of Reagents.

Repeatedly the assertion has been made, that a chemical analysis can only be considered as completed when it not only enables us to learn the constituents of a vegetable substance, but, with the assistance of the microscope, renders us so experienced that we know in which form, and at what place, to find the individual constituents in the material under examination, and make out whether

they are in the form of crystals or in the form of amorphous masses, or exist in a dissolved form in the contents of the cells, or as a constituent of the walls of the cell; also the density of its layers, and so forth. It is certain that we can only then say we know a plant or its parts when our investigations in chemical and anatomical directions are equally complete, and at the same time consolidated to a whole. But the assertion quoted is decidedly untrue from a chemical point of view, if correct from a botanical or a vegeto-physiological one. The chemical investigation has only to teach us the problem what constituents a plant contains, and in what quantities, which naturally fluctuates between two certain extremes.

Whatever relates to the place in which a constituent exists is certainly not a chemical question, even when it lies in the nature of things that with chemical assistance, or perhaps alone, or at least more easily and certainly than without such assistance, this question can be answered.

In physiology, in geology, and other sciences, there is an abundance of problems which only those are in a position to solve who possess a certain sum of chemical knowledge. On this account, these problems are merely physiological or geological ones, and the physiology or geology is, on this account, no chemistry, although when not studied with chemical knowledge they are less essentially advanced. When the chemist takes the arithmetical mean of the results of three elementary analyses, he is not necessarily an arithmetician, although he must have learnt to calculate to perform this operation; and when a chemist arrives at the remarkable idea of calculating the mean of his analysis according to the method of the smallest quadrate, nevertheless he is not a mathematician. The mineralogist is not a chemist when he tests a mineral with the blowpipe.

To return to the microscopic examination with the aid of reagents. It will be self-evident that it can only be undertaken when a correct qualitative analysis has already been performed with the material under examination, and the behaviour of the individual constituents with reagents has to be inquired into with exactness. It is also self-evident that we cannot conduct an examination of that kind with five or six reagents, as some persons still appear to consider at the present day. We must have confidence in the idea that we must test under the microscope in the same manner as without it. No one believes that simpler methods are employed in such chemical analysis, and that several reagents can be used when spectacles are worn. But a microscope is nothing else than spectacles which permit us to observe things which we are not able to see with our naked eyes on account of their smallness; it saves us chemical operations and chemical reagents quite as little as the spectacles of a short-sighted or long-sighted chemist are in a position to spare him such things. What we see under the microscope with the aid of reagents is only understood when we have been able, by a previous analysis, to know with precision the constituents. Whoever endeavours to learn anything under the microscope with the aid of reagents without a previous analysis and without a preliminary study of the constituents, is like a man who strives to read a book which is written in a language unknown to him, and therefore unintelligible to him with the assistance of a lens. The result is precisely the same. He will know as little after the labour has been done as he did before the commencement. The vegetable anatomist is quite right when he endeavours to accomplish his object by the application of some few reagents, and facilitates and renders possible his observations, because by a few chemical agents he makes certain outlines appear more defined, or compels some bodies to disappear, which prevent such observations. In chemical relations merely nothing results from these observations, as bodies are present which behave towards certain reagents precisely as many hundred other bodies, some of which we know accurately, others very little or not at all. Of bodies which are coloured brown by iodine, and such as are coloured red by sulphuric acid with the addition of sugar, there is an innumerable quantity. From such reactions on certain bodies, to establish certain classes of bodies, is folly.

To give a method for the microscopic examination of vegetable substances whose composition has been previously ascertained with exactness, and whose constituents have been accurately investigated with regard to their behaviour to the various reagents, is at the present time an impossibility. We have a mass of difficulties

therein to overcome, and the result of an investigation is frequently a doubtful when even a probable one, as we may have often and cautiously made observations, at least with regard to one or more constituents, when there was also frequently no difficulty in procuring certainty concerning other constituents.

§ 8.—*Conclusion.*

So far as was practicable in the present position of our knowledge, I believe that I have supplied a method for the examination of plants or their parts which does not easily permit a body to be overlooked which exists therein as a constituent. I believe, also, that by following the method given with some attention, suitable methods of separation can be easily devised to procure as many of the individual constituents as are necessary for the performance of a more minute examination of them, which will afford us again useful hints for devising improved methods of separation. When a minute examination of a constituent is intended, and consequently a sufficient quantity is to be prepared for this purpose, it is an unnecessary labour and a useless loss of time, when the order of analysis here described is pursued, to separate and prepare all the bodies which are contemporaneously present. We often attain this object very quickly when a certain quantity of the material is employed for the preparation of a constituent, and in this undertaking we have only a regard to this one constituent, and are disposed to sacrifice the remaining ones. This shorter and simpler method for the preparation of individual constituents can only be devised from the experiences which we have made by a systematic analysis, which has enabled us to learn all the constituents present, and given us the means to prepare smaller quantities of the individual constituent for the examination of its behaviour with other bodies, as far as it is necessary, to discover methods of preparation based on these experiences, which will enable us to procure larger quantities of the constituent for further investigation in the shortest possible time and with the least expense. When we have prepared sufficient quantities of all the constituents in an approximately pure condition, the next problem is to completely purify these bodies. This completely pure preparation of bodies is attended often with no difficulty, as, for example, is the case with easily crystallizable bodies or with volatile bodies when they exist with non-volatile bodies, or even with volatile ones if in reference to their chemical characteristics they are widely different. Generally, bodies of the opposite characters of an acid and a base are easily obtained pure when they are at the same time present with indifferent substances; likewise all bodies which are not *per se* crystallizable when they are capable of forming compounds, which can be readily obtained in a crystalline state. On the contrary, it is extremely difficult to completely separate indifferent amorphous substances when they exist mixed with one another, and to prepare in a state of purity the individual constituents of such mixtures. But the pure preparation is often not the greatest difficulty, but the establishment of the proof that the substance has been prepared in a state of purity. It is often possible to effect the pure preparation of a substance, but we have no index of the purity of the prepared substance. This is often the case with the amorphous and indifferent constituents of vegetables. There is frequently no other means for obtaining certainty with regard to the purity of a substance than by elementary analysis, conducted with portions of the substances which have been prepared in different ways from the same part of the plant, or where possible taken from different parts of the plant. The complete agreement in the results of the analysis of the different portions of the same substance affords a proof of its purity. The individual constituents which we have prepared in a pure isolated condition are submitted to a further chemical examination. The elementary analysis of these substances combined with their reactions, will supply us with an evidence whether the constituent found is or not identical with a body already known. A close examination, to the execution of which the previous analysis will afford assistance, will now teach us the constitution of the individual constituents. From this knowledge an insight is obtained into the connexion between the individual constituents, that is to say, our investigation will afford results quite as useful for vegetable physiology as for chemistry itself. We secure an important advantage by these investigations, when

we make the objects of our studies not only the various individual parts of a plant but also the various individual parts in different epochs of their development. Observations on the formation of a body from one or several others will bring most, easily light into the darkness in which the transformation of vegetable bodies is wrapped up. Correct analyses of plants, or rather of their parts, in their various relations, and their gradual development consequently, are a means to enlarge in a very productive manner not only our chemical, but also our physiological knowledge. In the hope of having, by the present work on the analysis of plants and their parts, contributed something towards the accomplishment of these aims, I submit these pages to the considerate judgment of the experienced chemist and to the zealous student in this field of inquiry, who has had no opportunity from his own experience to devise a method for the analysis of vegetable substances.

ON THE DISCREPANCIES IN THE STATEMENTS OF PELOUZE AND F. MOHR, RESPECTING THE SOLUBILITY OF GALLOTANNIC ACID IN ETHER.

BY PROFESSOR BOLLEY.

For the extraction of tannic acid from coarse gall-nut powder, in his "Displacement Apparatus," Pelouze recommends the use of ordinary, not absolute, ether. The liquid which then runs off, separates into two layers, the lower of which is thickish, while the upper is mobile and less coloured. The lower liquid contains the tannic acid, and is regarded by Pelouze as a solution of tannic acid in water; the upper liquid is stated to be ether, holding in solution small quantities of tannic acid, colouring matter, &c.

Mohr, in his commentary on the Prussian Pharmacopœia, decidedly contradicts this statement. His view of the matter has found its way into most Manuals of Chemistry, articles in Chemical Dictionaries, &c., and is generally received as correct. He regards the lower stratum of liquid above-mentioned as *a concentrated solution of tannic acid in ether*, and the upper, as *ether* which has dissolved only a small quantity of tannic acid. The two layers, he maintains, are not soluble one in the other. If this be so, it affords another example of a condition hitherto known to exist in one instance only (that of coniine), in which the solution of a body in a certain solvent is not diluted by contact with that same solvent. In spite of this anomaly, Mohr's statement has been adopted without experimental verification. Mohr rests his view on an experiment described by himself. On treating tannic acid with anhydrous ether, he obtained the thickish layer already mentioned, and above it there floated a stratum of ether, containing only a small quantity of tannic acid.

I have likewise examined this peculiar phenomenon. I find that *anhydrous ether* (previously decanted several times over chloride of calcium, boiling at 34·9° C., and having a specific gravity of 0·724 at 11·25° C.), takes up but a very small quantity of tannic acid, indeed scarcely any (0·206 p. c. at 5° C.), while the greater part of the tannic acid remains in the liquid in the form of a dry compact powder. On mixing the ether with half its volume per cent. of water, the thickish liquid is formed. The ether—the upper layer—when mixed with a little water, takes up rather more tannic acid than the anhydrous ether. I find that the upper layer—pure ether with 1 vol. p. c. of water—takes up 1·2 p. c. tannic acid.

This result appears to confirm Pelouze's view. It is not, however, true that the syrupy layer is a concentrated aqueous solution of tannic acid. On carefully removing a portion of this liquid, so that none of the upper stratum may mix with it, introducing it into a retort, and distilling with good condensation, considerable frothing takes place at first, and ether passes over, followed by water, the two liquids forming layers of equal depth in a cylindrical receiver.

If a little water be added to these two liquids, a third layer is formed, which rests between the two, and is therefore insoluble both in ether and in water. This behaviour appears to me to render probable the existence of a chemical compound of tannic acid, ether, and water, possibly an acid ethyl-salt constituted like ethyl-sulphuric acid, that is to say, a *tannate of ether and water*.

There is a practical deduction from these experiments which deserves to be mentioned. The behaviour of pulverized and well dried tannic acid to ether, is so peculiar that it may be used as a test of the presence of water in that liquid. In anhydrous ether the powder remains quite unaltered, but in hydrated ether it cakes together or deliquesces to a thickish syrup, according to the amount of water present, and the quantity of tannic acid added. Very small quantities of tannic acid give a distant reaction.—*The Quarterly Journal of the Chemical Society.*

CHEMICAL AND PHARMACEUTICAL PRODUCTS OF THE PROPOSED INTERNATIONAL EXHIBITION OF 1862.

(From the *Journal of the Society of Arts.*)

Sir,—As the project for holding a great Industrial Exhibition in the year 1862 is likely to be carried into execution, it becomes all those who feel an interest in the movement to offer what assistance they can towards its successful accomplishment.

From the pages of the *Journal* it appears that some of our colonies have already taken up the matter, and have resolved to contribute collections that shall fully represent their industrial resources. The execution of this design would probably be assisted, and the resulting collections enhanced in interest and value, if suggestions derived from the Exhibitions of 1851 and 1855 were drawn up and communicated, through the *Journal*, to committees abroad.

It is with this view that I take the liberty to offer some remarks upon the pharmaceutical products, both raw and manufactured, which we may hope will figure in the collections of 1862, and upon their mode of exhibition and the information that should accompany them. If those interested in other subjects would, in like manner, draw up a few notes on points to which it is desirable to direct attention, I cannot but think that useful results would follow.

The remarks I have to offer will be best arranged under the respective heads of *Unmanufactured Drugs*, *Chemical* and *Pharmaceutical Products*, to which I will add a few observations on the *Manner of Exhibition* and *Catalogues*.

Unmanufactured Drugs.—Substances of this class are not very attractive objects to the general public, but they are often extremely interesting and instructive to the man of science, as well as to the manufacturer. In the London Exhibition of 1851 there was a considerable collection of such products, but a far finer at Paris, in 1855. Specimens of raw drugs sent from foreign countries should be carefully packed, so that they may arrive in good condition; the great enemy to be guarded against being humidity, which occasions specimens to become mouldy. If sent from abroad arrangements should be made for examining them upon their reaching London, for rejecting any that have become spoiled, and placing such as are in a state for exhibition in suitable jars or cases. Every parcel should be labelled in the fullest and clearest manner, and each series of specimens should be accompanied by a list, giving fuller particulars than can be stated on a wrapper. In the case of a drug that is but little known, it is desirable to have the native name, and the scientific name also, whenever the latter can be given upon undoubtedly good authority. As a general rule, the economic product is the only part of a plant which it is needful to exhibit, but there are cases in which it would be extremely desirable to procure such specimens as would illustrate the origin of such product, the method of obtaining it, &c. Thus *Balsam of Tolu*, a production of New Granada, would be vastly more interesting if accompanied by pressed and dried specimens of the tree (now almost unknown) from which it is derived; and the same remark applies to Sarsaparilla, to Myrrh, to Gamboge, to Olibanum, and to numerous other drugs.

In the Paris Exhibition of 1855, there was a large collection of drugs from India, but unfortunately it was very ill-arranged. Many products, in fact, were never made accessible for exhibition at all, and could only be examined upon leave being obtained to open the bags containing them. Some specimens were placed in *stoneware* bottles, so that inspection was out of the question; while a vast number from Ceylon and from Java, Sumatra, and other islands of the Indian Archipelago, were destitute of intelligible labels, and wholly unarranged. It was also remarkable that the pharmaceutical raw products of some important countries were entirely unrepresented; and

that while there were admirable collections from French colonies, such as Pondicherry and Bourbon, and from some of our own colonies, as Jamaica and Demerara, almost nothing was contributed by Brazil, our settlements in China, our possessions on the West Coast of Africa, the Island of Trinidad, &c.

Chemical and Pharmaceutical Products.—This is a class of articles the exhibition of which draws forth a far more competitive spirit than the last; and considering the progress that manufacturing chemistry has made during the last few years, and the liberal character of our import duties, there cannot fail to be an ample display of contributions, both British and foreign. The experience of former Exhibitions does not suggest many remarks regarding this class of substances. I may, however, mention that enormous specimens of crystallized salts, such as the ferrocyanide of potassium, sulphate of copper, &c., shown in Paris in 1855, are less indicative of the goodness of the articles than of the expense and trouble of conveying them from the manufactory to the place of exhibition. Hydrochloric or sulphuric acids, in glass jars containing *gallons* (such as I saw in Paris in 1855), are also quite as efficiently represented by smaller samples. The excessive absurdity of an entire case filled with dozens of bottles of cod-liver oil, of one and the same sort, all properly sealed and labelled, and apparently ready for sale, need not be insisted on, and we may well wonder that such a display should be admitted. Specimens again, which are exhibited chiefly for their beauty of appearance, and which are evidence of no special skill on the part of the manufacturer, should bring little credit to the exhibitor. Of how much greater scientific value was the series of Dr. Frankland's organic radicals in the Paris Exhibition, than the heaps of brilliant, iridescent bismuth that so plentifully decorated the cases of many of the French chemical manufacturers.

Manner of Exhibition.—Under this head I would say a few words regarding the bottles and other receptacles in which specimens should be placed. In the Paris Exhibition there were vessels of honour and vessels of dishonour,—stone bottles, utterly impervious to light, and vases so elaborately cut and gilt that their contents were hardly more perceptible. Of course such extremes should be avoided; moreover, bottles should not (except where essential for the preservation of the specimens) be hermetically closed, but should be fitted with such covers that the contents can be readily examined by those authorized to do so. Every specimen should be most clearly and legibly labelled; but even in this we may have an excess. I have seen a nice series of jars from one of our colonies, the contents of which were almost completely hidden by the amplitude of the paper labels pasted round the glass. Labels, indeed, should give their information briefly, fuller details being reserved for catalogues, of which I will now speak.

Catalogues.—These are very desirable for all considerable collections of raw materials. In the Exhibitions of 1851 and 1855 there were several catalogues of particular departments, which could be had by those who felt interested to apply for them, though some, printed abroad, were difficult to obtain. The colonies of Algeria and British Guiana published very good catalogues, which may still be usefully referred to for information regarding the products of those countries in 1855. On the other hand, the products of Guatemala, New Granada, and Paraguay (and to some extent those of Mexico) were greatly diminished in interest from the impossibility of obtaining the information which well drawn-up lists would easily have afforded.

Apologizing for the length to which these remarks have extended,—I am, &c.,

Plough Court, Lombard Street, January, 14, 1861. DANIEL HANBURY.

MISCELLANEA.

Arsenical Flowers.—On February 9th, a young man named Bonnin appeared before the Tribunal of Correctional Police, to complain that the wife of an artificial flower maker, named Seplat, of the Rue Thérénot, had given to him a green powder to spread over certain flowers, assuring him that it was not arsenical; but that in the course of a fortnight it had caused eruptions on his face, and a constant taste of copper in his mouth, which had prevented him from taking his customary food, and had made him so ill that he was obliged to go to the hospital, where he stayed some time before he was cured. The tribunal condemned Madame Seplat to a

fortnight's imprisonment, and her husband, as responsible, to six days' imprisonment, and ordered them jointly to pay Bonnin 300 francs.

Poisoning by Arsenic.—An inquest has been held at the Bricklayers' Arms, New North Road, Hoxton, on the body of Ann Reading, aged twenty-four, who died from taking arsenic, at the residence of her father, 49, Pool Street. The evidence went to prove that the deceased had been a domestic servant, and returned home to the house of her parents, where some misunderstanding appears to have arisen respecting pecuniary matters, and subsequently the deceased was taken ill. A medical man was sent for, but the deceased expired shortly afterwards. It was then ascertained that she had swallowed a quantity of arsenic which she had found on a shelf. The father said the deceased had not taken the arsenic with a view of committing self-destruction, but had swallowed a portion to frighten him. This was borne out by two witnesses, to whom the deceased had made a statement.—The jury returned a verdict of "Died from the mortal effects of white arsenic, taken to frighten her father, and not intentionally to destroy life."

Alleged Poisoning by Absorption.—A curious question has arisen at Chester on the death of a child from presumed poisoning by laudanum through the mother's milk, the laudanum having been applied only externally to the side of the mother of the child. The mother was suffering from severe pain on the right side, and twelve grains of Dover's powder were administered, by Dr. Watson's directions, internally, and a fomentation of laudanum applied to the seat of pain, with directions not to let the child suck whilst the pills were affecting the system. The child was put to the breast soon after the medicine was given and the fomentation applied. It fell asleep, and next morning was found dead. The mother had only been rendered a little drowsy, but the pain had been relieved.

Without any *post-mortem* examination, the coroner's jury returned the following verdict: "That the deceased died from the effects of the absorption of laudanum externally applied to Fanny Sutcliff, the mother of the said child; and the jurors are of opinion that Dr. Watson is culpable for not having given more specific directions as to the quantity of laudanum which should have been used as an external application, knowing the said laudanum to be a deadly poison."

Poisoning by Mistake.—An inquest has been held at Manchester, on the body of Mr. S. G. Flukes, aged 28, who kept a boarding-house in Lever Street. The facts are as follows:—The young man had been suffering some time from tic-doloreux, and a friend lent him a prescription which had been of service to himself. This consisted of mixture, pills, and liniment, all of which he had compounded. A few days afterwards, on going to bed, he mentioned to his wife that he would take a blue pill and black draught. He took the pill, and went to bed (having, it seems, put the draught on the dressing table, on which were also the medicines he had procured from the lent prescription), got up about six o'clock to take the draught, and by mistake drank the liniment. This consisted of ℥ss. Tr. Aconiti (Fleming), ℈ij. Ext. Belladonnæ, and Lin. Saponis ad ℥iss. Two surgeons were in attendance, and used all the means in their power, but the deceased was seized with convulsions, and died about nine o'clock the same morning. The bottle containing the liniment was properly labelled. The jury returned a verdict that the deceased had poisoned himself through misadventure. It was suggested by one or two of the jury that a recommendation should be added to the verdict, requiring druggists to dispense poisonous preparations in peculiar shaped bottles; but, after some little conversation, it was thought that this would produce at least as much harm as good, and the suggestion was negatived.

SUICIDE BY LAUDANUM.

On Monday, January 28th, an inquest was held by Peter Parry, Esq., at the Holywell Union Workhouse, on the body of Simeon Jacob, a pauper inmate, who committed suicide by drinking a quantity of laudanum. It appeared from the evidence that on the previous Saturday deceased was found on the Penymaes Road in a state of stupor. A two-ounce bottle labelled "Laudanum," but without

the word "Poison," and with the name, "John Jones, Chemist and Druggist, Holywell," was found in his pocket. Medical assistance was obtained, and the usual remedies tried, but to no purpose, and he died on the Sunday morning.

Dr. Williams, one of the medical attendants, stated that there was no doubt that death resulted from the effects of laudanum.

The Coroner said that lest any one should run away with an erroneous idea, he should state that the law did not require a label of "Poison" on laudanum. It was not imperative to put "Poison" on every article. He also stated that there was no evidence that the contents of the bottle was obtained from Mr. Jones.

Mr. Jones then came forward, and said the laudanum was obtained from him. He took every precaution in giving it, and explained to the jury the questions he put to the deceased before giving it, which were answered satisfactorily. He inquired of the deceased if he was aware that it was poison, to which he replied that he was perfectly aware of it.

The Coroner then addressed the jury, in the course of which he said that there was once an Act of Parliament in the House, which would, had it passed, have rendered Mr. Jones liable to punishment for selling laudanum without a label "Poison" on it; but that Act did not pass into law—he believed that it was withdrawn.

The following verdict was then returned:—"The Jury are of opinion that deceased died from the effects of laudanum, which he took during a fit of temporary insanity. And they also wish to express their opinion, that they consider it very advisable on the part of Mr. Jones, not to sell any more laudanum without a label 'Poison' on it."

The Coroner: You can put poison on a great many things, on vitriol, if you like; and I should be sorry that this jury should dictate anything impossible.

OBITUARY.

DEATH OF J. F. MACFARLAN, ESQ.

We have this month to record the death of a member of the Pharmaceutical Society and of its Council, Mr. J. F. Macfarlan, of Edinburgh, whose loss will be extensively felt and deeply regretted. The following notice is abridged from a Scotch paper, *The Witness*:—

"It is with no ordinary feeling of regret that we announce the death of this highly estimable gentleman, which took place on the morning of Wednesday, the 20th of February, in the seventy-first year of his age. There are comparatively few men privileged to pursue so lengthened a career of usefulness as that by which Mr. Macfarlan's life has been distinguished. Full forty years have passed since he began to take an interest in public matters; and during nearly the whole of that period he was to be found engaged in every movement, having for its end the welfare of his fellow-men, whether political, religious, social, moral, or economic. Liberal in his politics, he never shrank from taking an active part in the long-protracted contest in behalf of constitutional self-government against the old close political system under which the country had so long groaned, yet was he entirely free from all taint of those extreme views of popular rights which tend to anarchy and misrule; and when the Municipal Reform Bill first became law in 1833, his fellow-citizens marked their appreciation of the value of his public services by placing him at the head of the poll. His fellow-councillors also followed up this mark of respect by electing him to be one of the magistrates; and many may still remember, as do we ourselves, the humane and Christian spirit in which he administered judgment from the bench of the Police Court, especially when called upon to deal with cases of juvenile depravity, or where destitution was found to be parent to the crime.

"Mr. Macfarlan had obtained the diploma of the Royal College of Surgeons of Edinburgh, and in early life practised for a short period; but he soon afterwards devoted himself to the business of a chemist and druggist, which he carried on with much success. On the formation of the Pharmaceutical Society he became one of

its members, and for many years has been the representative of the Scottish branch at the London Board. In 1818 he joined the Royal Medical Society of Edinburgh, was elected one of its Presidents in 1822, and in 1850 had the distinction of Honorary Member conferred upon him. For upwards of thirty years he held the office of Treasurer to the Society, and took a warm interest in the management of its affairs to the last.

"He was a zealous member of the Free Church, and long acted as an elder in Free Tolbooth congregation; but latterly, on the removal of that congregation to the New Town, he attached himself to the Free High Church. The amiability and cheerfulness of his disposition endeared him to all who knew him; and, combined with his long and unwearied career of public usefulness, will hallow his memory in the esteem and affection of a very numerous circle of friends. Of him it may be truly said, that to know him was to love him."

BOOKS RECEIVED.

ADULTERATIONS DETECTED, *or Plain Instructions for the Discovery of Frauds in Food and Medicine.* By ARTHUR HILL HASSALL, M.D., &c. Second Edition. London: Longman, Green, Longman, and Roberts. 8vo, pp. 712. 1861.

A MANUAL OF ELEMENTARY CHEMISTRY, THEORETICAL AND PRACTICAL. By GEORGE FOWNES, F.R.S., &c. Eighth Edition, revised and corrected. London: John Churchill, New Burlington Street. 8vo, pp. 771. 1861. (From the Publisher.)

A MANUAL OF PHOTOGRAPHIC CHEMISTRY, *including the Practice of the Collodion Process.* By FREDERICK HARDWICH. Sixth Edition. London: John Churchill, New Burlington Street. 8vo, pp. 571. 1861. (From the Publisher.)

TO CORRESPONDENTS.

An Apprentice (Belper).—The course of study would comprise an adequate knowledge of Latin, to enable the student to read the Pharmacopœia in that language; also an elementary knowledge of chemistry, materia medica, and botany. Where courses of lectures and of practical instruction are not available, the judicious employment of leisure time in the study of the following books would probably be found sufficient in preparing for the Minor Examination:—*Latin Pharmacopœia*, *Selecta è Prescriptis*, Bentley's *Manual of Botany*, Royle's or Pereira's *Materia Medica*, and Fownes's *Manual of Chemistry.*

T. F.—Yes; but no prize was given.

J. P. (Cork).—It is uncertain when the work will appear.

A Member.—Tomes's *Manual of Dental Surgery.*

D. W. (Lewisham).—In the decomposition alluded to, the vegetable colouring matter is precipitated.

A Member (Cambridge).—Aylieff's Displacement Apparatus, made by Cliff and Co., Imperial Potteries, Lambeth.

Aqua (Oxford).—The Aërated Lithia Water in general use is made in the proportion of either two grains or five grains of the salt to each bottle.

A. B. (Norwich).—(1.) The crystals are carbonate of magnesia, deposited in consequence of the solution having lost a portion of carbonic acid. (2.) Benzoic acid.

E. M. H. (Plymouth).—(1.) Babington's *Manual of British Botany.* (2.) Red lead. (3.) The change alluded to is produced by the tannin.

The communications of *Mr. Marres* and *Mr. Rhodes* will be attended to.

ERRATA.—At page 433 of the number for February, at line 10, *for* 32.74 *read* 3274; line 40, *for* $\frac{1}{3}$ *read* $\frac{1}{330}$.

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, ELIAS BREMRIDGE, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. CHURCHILL, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.

SECOND SERIES.

VOL. II.—No. X.—APRIL 1st, 1861.

THE REPRESENTATION OF PHARMACY AT THE EXHIBITION OF 1862.

Arrangements are in progress for holding the second of our International Exhibitions next year, and if Pharmacy is to be properly represented on that occasion, it is full time that attention should be directed to the subject, and measures adopted which may contribute to the production of a creditable collection of chemical and pharmaceutical products. At the Great Exhibition of 1851, although there was a fine display of some articles of chemical manufacture, the subject of Pharmacy was on the whole but imperfectly represented. It is to be hoped that such will not be the case in 1862. Many persons who omitted to exhibit on the previous occasion, in consequence of their not knowing what, or how, they could do so with effect, are now better informed on these points, and moreover, will have a stronger inducement to be active contributors on the next occasion, in consequence of the credit and success which attended the Exhibition of 1851.

Taking the whole range of pharmaceutical products, including drugs and their preparations, there appears, at first sight, to be much that is not well adapted for public exhibition. What good could result from the exhibition of ordinary commercial samples of drugs, or of such preparations as tinctures, extracts, ointments, &c.? If these were indiscriminately exhibited without any special objects being contemplated, there would be no result to compensate for the attendant trouble and expense. Yet we believe that articles such as those referred to might be exhibited with advantage, if their selection and description were made subservient to certain special objects. One of the objects contemplated in such cases would be the comparison of the drugs and medicines of our country with those of other countries. Are senna, scammony, black hellebore, calamine, milk of sulphur, &c., subject to the same adulterations abroad that they are here? To make the exhibition available for answering this and other similar questions, it would be necessary that there should be previous concert among those engaged in selecting specimens, and the contemplated object would be greatly promoted if all pharmaceutical products, from whatever countries obtained, were exhibited in one compartment, where they would admit of com-

parison more readily than if they were distributed in different parts of the building.

Pharmaceutical preparations are generally little suited for exhibition, unless it be with some special object. Thus, with reference to tinctures, while their indiscriminate exhibition would be useless, it would be otherwise if specimens were prepared by different operators according to specified processes, the results of which would be thus brought into comparison. There might be tinctures made by maceration, some specimens macerated for seven days, others for fourteen days, and others again for some greatly lengthened period, such as fourteen weeks. Then, of these tinctures, there might be the products decanted from the dregs, and those afterwards obtained by expression. Again, there would be the same tinctures made by percolation, and in every case the exact conditions under which the product was obtained should be described. With reference to extracts and ointments a similar course might be pursued, the products of different processes being brought into comparison. Among the ointments we should have those in which substitutes for the ordinary fatty menstruum were used, the old processes being put into competition with proposed improvements. If this were done, the results would be both interesting and instructive; and it is obvious if such a course could be adopted with advantage in reference to the preparations named, it would be equally applicable to others, such as distilled waters, concentrated infusions, syrups, &c. These are just the class of preparations, with reference to which doubts have been expressed as to whether they are suitable for exhibition at all. We think there is one condition that ought to be imposed upon their admission, which is, that all such preparations should be accompanied with a description of the processes by which they have been produced. It is obvious that nothing short of this would afford a correct indication of the nature and properties of the preparations. In the case of substances which have a definite chemical composition it would be otherwise. These constitute a class of pharmaceutical products which are obviously more suitable for exhibition than the other, and would, no doubt, be much more largely exhibited. But, even with reference to chemical compounds, there are many combinations introduced into medicine which have an empirical character, and it is questionable how far such should be admitted without some further description than the indefinite or inappropriate names which are sometimes given to them.

We have thus adverted to a few points relating to the exhibition of chemical and pharmaceutical products with the view of eliciting a discussion of the subject, and of inducing our readers to enter upon the practical consideration of what they shall exhibit, and how and when they are to commence preparations for the Exhibition of 1862.

ALCHEMY IN THE NINETEENTH CENTURY.

It is hardly consistent with the prevailing opinion of the advanced state of the intelligence and the scientific attainments of the more wealthy classes of our population, to find that in the city of London, in the year 1860, merchants, clergymen, and others—men of education and position—could be induced to advance large sums of money to a foreign adventurer, upon the representation that he could transmute base metals into standard silver, and that these men could be deceived into the belief that they had seen such transmutation effected. Yet such appears to have been the case. In June of last year, Nicholas Papaffy, a Hungarian refugee, represented that he had an invention by which he could "convert metals and other materials into standard silver," and that he was anxious to join with some men of capital in applying this invention for their common benefit. Of course he would have no difficulty in finding men to join him if he could only convince them of the reality of his invention, and even this he appears to have easily accomplished.

Were there not frequent changes, nay sometimes complete revolutions, in chemical science? Were not men, even the most eminent of Chemists, speculating upon the possibility of resolving the sixty-three so-called elements into some comparatively small number of really elementary bodies? Was not clay made to yield up a metal as beautiful as silver itself? Was not a new metal discovered the other day in the waters of a spring? Then, why not produce an old metal from a new source? The alchemists of former days were satisfied with nothing less than the production of pure gold, but their reputation had suffered from the many failures in their attempts which have been recorded. The modern alchemist was satisfied with a less ambitious idea. In the pursuit of modern science he had discovered the means of making silver. It was not, indeed, produced without some cost, but would nevertheless be a good commercial speculation. He wanted some bismuth, aluminium, and a few other ingredients, a crucible, a furnace, and men with plenty of money and plenty of faith. All these were placed at his disposal, and he proceeded to manipulate in the presence of Barnett, Cox, Cole, and Company. From the crucible a mass of silver of some ten pounds weight was produced, and confidence was established in the members of the new company, who forthwith took offices at 104, *Leaden-all* Street (a very appropriate residence), and commenced trading under the names of Papaffy, Barnett, Cox, and Co. The inventor, Papaffy, was to receive £12 a week as his share of the profits (very moderate under the circumstances), and having drawn about £600 in advance, and raised a few thousands (it is said about £10,000) on bills drawn in the name of the firm, he very considerately left the furnace, the crucible, and we presume the ten pounds' weight of silver, to liquidate the debts, while he pursued his travels in search of new discoveries and new victims.

TRANSACTIONS
OF
THE PHARMACEUTICAL SOCIETY.

FINANCIAL STATEMENT—*From 1st January, to 31st December*, 1860.

RECEIPTS.	£	s.	d.
Balance in Treasurer's Hands	89	5	7
Life Members' Fund:			
Fees ... 147 0 0			
Interest ... 49 8 9			
	196	8	9
Benevolent Fund:			
Subscriptions ... 49 11 0			
Interest ... 153 19 7			
	203	10	7
Government Securities, Interest	194	5	11
Legacy, per Executors of the late Jacob Bell	2000	0	0
Proceeds of Sale of £5108 0 9 Stock	4694	18	10
Rent	151	0	0
Fees:			
37 Pharmaceutical Chemists ... 207 18 0			
59 Assistants ... 238 7 0			
80 Apprentices ... 168 0 0			
	614	5	0
Subscriptions:			
363 London Members ... 381 3 0			
1561 Country Members ... 1639 1 0			
130 Associates ... 68 5 0			
53 Apprentices ... 27 16 6			
	2116	5	6
Arrears of Subscription	35	14	0
Lecture Fees	47	5	0
Balance of Petty Cash due to Secretary	4	0	8
	£10,346	19	10

EXPENDITURE.	£	s.	d.
Life Members' Fund:—			
Investment	357	0	0
Benevolent Fund:			
Investment ... 413 14 6			
Gratuities ... 40 0 0			
	453	14	6
Government Securities, Investment	2000	0	0
Conversazione ... 51 18 11			
Pharmaceutical Meetings 3 15 3			
Sundries ... 3 1 0			
Repayments ... 9 9 0			
	68	4	2
Ditto to Secretary (Petty Cash)	2	6	11
House Expenses	4	18	2½
Rent, Rates, Taxes, and Insurance (including £50 to Secretary for Rent)	494	5	9
Alterations and Repairs	66	12	1
Fixtures and Fittings	33	7	3
Apparatus	17	8	1½
Museum	33	5	6
Library	38	15	1
Journals, Postage, &c.	599	10	3
Furniture	5	7	6½
Printing and Engraving	38	7	6
Advertisements	3	7	6
Stationery	2	17	5½
Postage	36	15	4
Carriage	1	17	11
Collector's Commission	32	15	7
Travelling Expenses	125	19	0
Salary to Secretary	250	0	0
Wages	163	1	8
Pension to late Secretary	112	10	0
Expenses of Society in Scotland	64	9	8
Board of Examiners	78	15	0
Professor of Chemistry and Pharmacy, including duties as Curator in his department, and payment of Assistant	300	0	0
Professor of Materia Medica and Botany, including duties as Curator in his department, and payment of Assistant	250	0	0
Subscription to Royal Botanical Gardens	21	0	0
Prize Medals, &c.	7	2	0
Law Costs (4 years' account to Executors of the late Mr. Brace)	154	17	6
Mr. Batterbury, Contractor, for Alterations, &c., on ac., £3380, appropriated & apportioned to the following accounts, viz.:—			
Laboratory ... 1455 0 0			
Fixtures & Fittings 970 0 0			
General Repairs ... 820 0 0			
Alteration of Lecture Hall (in part) 135 0 0			
	3380	0	0
Messrs. Lansdown, Architects, on account	50	0	0
Mr. Mayhew, Surveyor	52	10	0
Balance in Treasurer's hands	1045	18	4
	£10,346	19	10

We, the undersigned Auditors, have examined the Accounts of the Pharmaceutical Society, and find them correct agreeably with the foregoing statement, and that,

as shown by the Books of the Society, there was standing in the names of the Trustees of the Society, at the Bank of England, on the 31st of December, 1860:

On Account of the General Fund, New 3 per Cents.	£2643	0	2
Benevolent Fund, 3 per Cent. Consols.....	5573	16	0
Life Members' Fund, 3 per Cent. Consols	1998	10	4

EDWARD CONSTANCE,
BENJAMIN HUMPAGE,
ARTHUR BOWDLER HILL,
JAMES B. BARNES,
} *Auditors.*

March 1st, 1861.

SUBSCRIBERS TO THE BENEVOLENT FUND, 1860.

	£	s.	d.
Althorp, James, Stamford	0	10	6
Arnold, Edward, Norwich	0	5	0
Balmer, J., 94, St. John's St. Rd.	1	1	0
Barry and Son, Northampton	0	10	6
Beach, Thomas, Bridport	0	10	0
Best, John D., 28, Suffolk Street, Pall Mall	1	1	0
Bevan, Charles F., Harwich ...	0	10	6
Bird, W. L., 42, Castle Street, Oxford Street	0	10	6
Blake, Sandford, and Blake, 47, Piccadilly	1	1	0
Bolton, Thos., Tenterden	0	5	0
Bond, Charles, Kidderminster	1	1	0
Bond, John, Yarmouth	0	7	6
Bourdas, Isaiah, 10, Pont Street	0	10	6
Boyce, John Pierce, Chertsey...	0	5	0
Bradley, John, 21, Belgrave Rd.	0	10	6
Brailey, Charles B., Heavitree.	0	5	0
Brearey, William, Douglas ...	0	2	6
Carr, Wm. Graham, Berwick...	1	1	0
Cartwright, Wm., Newcastle-under-Lyne	0	10	6
Christopher, Wm., Crickhowell	0	5	0
Coles, J., New Rd., Camberwell	0	10	6
Cooper, George, Exeter	0	5	0
Cullen, William, Walworth ...	0	10	6
Cumbers, John, Wandsworth...	0	10	6
Cupiss, Fras., Diss	0	10	6
Darby & Gosden, 140, Leadenhall Street.....	2	2	0
Davies, Charles, 11, Claremont Place, N. Brixton	0	5	0
Davies, Henry E., 43, Wood Street, City	0	10	6
Deane, Henry, Clapham.....	1	1	0
Dyer, Thomas, Exeter	0	5	0
Eddy, Charles William, 30, Crown, Street, Finsbury.....	1	1	0
Evans, John H., 60, Bartholomew Close...	1	1	0
Fox, William, 48, Church St., Bethnal Green	0	10	6
Gedge, Wm. S., 77, St. John St.	0	5	0
Glover, George, 19, Goodge St.	1	1	0
Goodbarne, Thomas, 13, Charles Place, Hoxton	0	10	6
Goodwin, John, Lower Clapton	0	10	6
Haselden & Fisher, 18, Conduit Street.....	1	1	0
Hills, Thomas H., 338, Oxford Street.....	1	1	0
Hollier, Elliot, Dudley	0	10	6
Hudson, William B., 27, Haymarket	1	1	0
Hurst, Wm. T. H., Hempstead	0	5	0
Husband, Matthew, Exeter ..	0	5	0
Jackson, Thos., Manchester ...	0	10	6
Knight, John, Cambridge	0	10	6
Leggett, J. Tudway, Wareham	0	5	0
Lescher, Joseph S., 60, Bartholomew Close.....	1	1	0
Long, W. E., Chichester.....	0	10	6
Macfarlan, John F., Edinburgh	2	2	0
May, John, Battersea	0	10	6
Meggeson, George, Wandsworth	0	10	6
Middleton, F., 338, Oxford St. ...	0	10	6
Moore, James Lodge, 1, Craven Street, Westbourne Terrace..	0	10	6
Nind, George, Wandsworth ...	0	10	6
Noakes, Richard, Brighton.....	0	10	6
Otter, William, Bloxham	0	5	0
Palk, John, Exeter	0	5	0
Penrose, Arthur W., 7, Amwell Street, Clerkenwell	0	5	0
Pocklington, James, Sydenham	0	10	6
Pollock, T. 129, Fenchurch St.	1	1	0
Pratt, John, Chichester	0	10	6
Proctor, William, Newcastle...	1	1	0
Rankin, William, Kilmarnock.	1	1	0
Rastrick, Joseph L., Southsea...	0	5	0
Rea, Edward, 115, Wardour St.	1	1	0
Rea, James P., 115, Wardour St.	0	5	0
Redfern, J., Ashby-de-la-Zouch	1	1	0
Robinson, James Mowld, Beverley.....	0	5	0
Shirley, John George, 1, Westbourne Grove, Bayswater ...	0	10	6
Smith, Wm. Frederick, Keen's Row, Walworth	0	10	6
Spencer, Charles, Gravesend...	1	1	0
Starkie, James, 4, Strand	1	1	0
Stone, John, Exeter.....	0	5	0
Tanner, Nicholas W., Exeter...	0	5	0
Tucker, Charles, Bridport	0	10	6
Warner & Barclay, Fore Street, City	1	1	0
Watlock, John D., Wandsworth	0	10	0
White, Daniel, Park Terrace, Regent's Park	1	1	0

AT A MEETING OF THE COUNCIL, 6*th March*, 1861,

Present—Messrs. Bird, Bottle, Brady, Bucklee, Davenport, Edwards, Hanbury, Haselden, Herring, Hills, Lescher, Meggeson, Morson, Sandford, Squire, and Waugh, the following were elected

MEMBERS.

BRIDPORT .....Beach, James
LEEDS ... .Calvert, John

MAJOR EXAMINATION, 19*th March*, 1861.

Cornish, William .....Brighton
Elliott, Robert .....Newcastle-on-Tyne
Hustwick, Thomas H.....Harrogate

MINOR EXAMINATION.

Bray, John .....Barnstaple
Fox, Edward M. .....Falmouth
Garland, Alfred Philip .....Hereford
Jones, Walter William .....Brecon
Long, Frank .....Brighton
Pratt, Henry.....Stratford-on-Avon

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS.
Carré, Joseph	Mr. Tylee	Bath
Cantrell, William Seaward	Mr. Tylee	Bath
Edwards, Charles Richard	Mr. Gunn	Harrow-on-the-Hill
Kite, John Cazeneuve	Mr. King	Rochester
Lasham, John William	Mr. Kendall	Stratford-on-Avon
Walker, Alfred	Messrs. Durant and Cousins	Dorking
Watts, Charles Cracknell	Mr. Clarke	Richmond (Surrey)
White, William	Mr. Bottle	Dover

ERRATA, page 445, *for* Adkins, Ernest, *read* Atkins, Ernest.
" *for* Watt, John Newton, *read* Watts, John Newton.

EXAMINATION IN EDINBURGH, 19*th March*, 1861.

MAJOR.

Allan, William.....Dumfries
Metcalfe, John Sykes .....Preston

MINOR.

Richardson, Robert .....Dumfries

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS
Finch, Thomas	Mr. Aitken	Edinburgh

BOTANICAL PRIZE FOR 1862.

A SILVER COUNCIL MEDAL

Is offered for the best Herbarium, collected in any part of the United Kingdom, between the first day of May, 1861, and the first day of July, 1862; and should there be more than one collection possessing such an amount of merit as to entitle the collectors to reward, a second prize, consisting of a Bronze Medal, and also Certificates of Merit, will be given at the discretion of the Council. In the event of none of the collections possessing such an amount of merit as to warrant the Council in awarding Medals or Certificates, none will be given.

The collections to consist of Phanerogamous plants and Ferns, arranged according to the Natural System of De Candolle, or any other natural method in common use, and to be accompanied by lists, arranged according to the same method, with the species numbered.

The collector to follow some work on British Botany (such as that of Babington, Bentham, or Hooker and Arnott), and to state the work which he adopts. The name of each plant, its habitat, and the date of collection, to be stated on the paper on which it is preserved.

Each collection to be accompanied by a note, containing a declaration, signed by the collector, and certified by his employer or a Pharmaceutical Chemist known to the collector, to the following effect:—The plants which accompany this note were collected by myself, between the first day of May, 1861, and the first day of July, 1862, and were named and arranged without any assistance but that derived from books.

In estimating the merits of the collections, not only will the number of species be taken into account, but also their rarity or otherwise, and the manner in which they are preserved, and should a specimen be wrongly named, it will at once be erased from the list.

The collections to be forwarded to the Secretary of the Society, 17, Bloomsbury Square, on or before the first day of August, 1862, endorsed "Herbarium for Competition for the Botanical prizes." If required, the collections will be returned after competition.

No candidate will be allowed to compete unless he be an Associate, Registered Apprentice, or Student of the Society, or if his age exceed twenty-one years.

FREE ADMISSIONS TO THE ROYAL BOTANIC SOCIETY'S GARDENS, REGENT'S PARK.

The following pupils of the Class of Materia Medica and Botany, in the Pharmaceutical Society, having passed a satisfactory examination in the Elements of Structural and Physiological Botany, were recommended by Professor Bentley to Mr. Sowerby, the Secretary of the Royal Botanic Society, for Free Admission to the Gardens in the Regent's Park, and the privilege was at once liberally accorded to them:—

Mr. W. M. Capner
— J. M. Davenport
— A. P. Garland
— W. Grindley
— T. J. Hasselby
— J. D. Jones
Mr. J. H. Lescher
— G. N. Maxwell
— J. C. Preston
— A. J. Sanders
— James Spearing
— Robert Towers.

These orders will admit the above Students to the Gardens upon ordinary days in the months of March, April, and August, from 9 A.M. till 1 P.M.; and in May, June, and July, from 7 A.M. till 1 P.M. Such admission orders, therefore, give every facility to those who possess them of making themselves practically acquainted with plants.

PHARMACEUTICAL MEETING.

Wednesday, March 6th, 1861.

MR. T. N. R. MORSON, PRESIDENT, IN THE CHAIR.

DONATIONS TO THE LIBRARY AND MUSEUM

were announced as follows:—

The Journal of the Society of Arts. From the Society.
The Photographic Journal. From the Society.
The Chemist and Druggist. From the Editor.
The Chemical News. From the Editor.
The British Journal of Dental Science. From the Publisher.
The Technologist. From the Editor.

Rules, Regulations, and List of Members of the Army and Navy Club. From the Club.

A Photograph of the late Dr. Baly. From Mr. W. L. Bird.

Vermischte Schriften Botanischen Inhalts. From Dr. Von Martius.

A Specimen of Poaya do Campo. From Dr. Theodore Martius.

Specimens of Actæa racemosa. From Messrs. Bell & Co. and Mr. Hanbury.

Specimen of Dietetic Bael. From Messrs. Bullock and Reynolds.

The following Papers were read:—

ON THE ADULTERATION OF SENNA WITH ARGEL LEAVES.

BY PROFESSOR BENTLEY.

Professor Bentley said that, in the absence of any regular communications for the evening meeting, he was induced to introduce to the notice of the Society the extensive and systematic adulteration of Alexandrian Senna which was now practised. He had no new adulteration to refer to, but only intended to notice one which had been previously before them, which was now commonly believed to have been discontinued, but which he thought was practised again to a most serious extent—he meant the adulteration of Senna with Argel leaves, and he was quite sure that everything connected with such an important drug as Senna could not fail to be of practical interest to the Pharmaceutist.

It was now nearly twenty years since the adulteration of Senna with Argel leaves, derived from *Cynanchum* (*Solenostemma*) *Argel*, belonging to the natural order Asclepiadaceæ, was first brought under the notice of the Pharmaceutical Society by our late lamented President, Mr. Bell. Mr. Bell stated that he was induced to do so, from the frequent complaints which were at that period made upon the unsatisfactory and unpleasant action of Alexandrian Senna. In Scotland and Ireland, indeed, the use of Alexandrian Senna had been almost superseded by other kinds, more especially by that of Tinnivelly Senna, on account of these unfavourable results.

At that time Alexandrian Senna was systematically adulterated with Argel leaves, and so great was the ignorance in this country upon the matter, that the presence of these leaves in Senna was commonly overlooked, and they were in some cases publicly sold at a high price under the name of Heavy Senna. The quantity of Argel leaves contained in Alexandrian Senna was liable to much variation, but on an average, Argel leaves constituted about one-fifth part of the original bales of this variety of Senna.

An interesting discussion followed the reading of Mr. Bell's communication, and it was recommended to the Members to abstain as far as possible from the purchase of Alexandrian Senna, and to use other varieties of Senna instead, unless such a gross adulteration was forthwith discontinued. The effect of such a determination on the part of the Members of the Society, when published in the *Pharmaceutical Journal*, was soon made evident, for in a short time the admixture of Argel leaves with Alexandrian Senna became less evident, and in a few years, such an adulteration was the exception, rather than the rule, as formerly. No better illustration of the effect of such a Society as the Pharmaceutical could be adduced, than this adulteration, and nothing could more prominently exhibit the advantages to be derived by the public generally from such an association.

About the year 1852, having been applied to by one of my colleagues in a medical school to which I was then attached, for a specimen of Alexandrian Senna adulterated with Argel leaves, I was led to examine different samples, and the result was, that I had very great difficulty in finding what I required; and hence, at that period, it is quite evident that, the admixture of Argel leaves with Alexandrian Senna was but rarely practised. For some years subsequent

to 1852, also, I believe, that Alexandrian Senna was generally free from such an admixture, and I think continued so till about three years since, at which period, upon examining some bales of Alexandrian Senna, I found them to contain a large amount of Argel leaves. My attention was afterwards called to this admixture by several correspondents, who forwarded specimens of the same; and upon examination recently, of Alexandrian Senna both as imported, and in a picked state, I have every reason to believe that, it is adulterated to a very large extent with Argel leaves, probably quite as much so, as when such an adulteration was first noticed by this Society.

The causes which have led to the return of this adulteration are, probably:—in the first place, a deficiency in the Senna crop during the last three or four years; and, secondly, to the notion that the adulteration had been forgotten. Here we cannot but again remark the importance of our Society, which is necessary not only to make known and stop adulterations when first pointed out, but also to be ever watchful to prevent the return of any of the adulterations which have been thus checked.

In order to prove that such an admixture extensively occurs at present, I have only to call the attention of those around me to the specimens of Alexandrian Senna upon the table. Some of these were obtained by myself, or were given to me by pupils and others, and some were brought here by Mr. Gale, who had intended to have brought this subject himself before the Society, had I not done so.

The specimens were taken both from original bales of Alexandrian Senna and from picked samples as commonly sold, and all of them contained large quantities of Argel leaves; and in one of them, I found also, some pods and a few leaves of *Tephrosia Apollinea*, a plant belonging to the Leguminosæ, and therefore to the same natural order as the species of Cassia from which the different varieties of Senna are obtained. The adulteration of Alexandrian Senna with Tephrosia has been noticed previously, but it never occurs to any great extent. One sample forwarded by Mr. Gale contained as much as twenty-five per cent. of Argel leaves, and the party from whom Mr. Gale obtained it, characterised it as one of the boldest samples he had ever met with in the market. A sample from Mr. Horncastle, of Albion Street, Hyde Park Gardens, contained in 100 parts by weight, 42.1 of Senna leaves, 33.3 of Argel leaves, 9.1 of Argel flowers and fruit, 9.9 of Senna stalks and seeds, 3.2 of stones and dirt, and 2.4 dust and loss. This sample contained, therefore, nearly as much Argel as Senna. Two other samples which I obtained myself contained respectively 30 and 20 per cent. of Argel leaves. The samples above alluded to are the worst that I have seen, but nearly all that I have recently examined were found to be more or less adulterated with Argel leaves. All the specimens being upon the table, it is not necessary to refer to them further, as any one present may examine them and draw his own conclusions. Enough has, however, I believe, been stated, to show that Alexandrian Senna is again much adulterated with Argel, and I believe much good will be done by the matter having been brought before this Society, as it will show to the world that we are always on the look out for adulterations, and at the same time are prepared to do all in our power to expose and prevent them.

Professor Bentley then alluded to the therapeutic action of Argel leaves, upon which he said great differences of opinion existed. The more common belief now entertained of their action was, that they possessed little or no purgative effect, but produced griping, sickness, and other unpleasant symptoms. One writer, Heberlein, has however stated that a watery infusion of the leaves had no appreciable effect, either as a purgative or in any disagreeable way. Again, it is said, that in the districts where Alexandrian Senna is collected, the natives commonly use Argel leaves as a purgative. Amongst such conflicting opinions,

it is impossible to come to any positive conclusions respecting its action, but he thought that a great deal of the griping, sickness, and other unpleasant effects which frequently followed upon taking a dose of Alexandrian Senna, were due to the Argel leaves it contained, although he certainly did not ascribe the whole of these effects to them, because, as was now well known, Senna of itself, when perfectly pure, produced frequently some griping and sickness. The idea that the griping action of Senna was due to the stalks was altogether erroneous, as their action was quite as mild as the leaflets. Professor Bentley concluded by saying that, it was not the question of the action of the Argel leaves upon the system that had induced him on the present occasion to bring before the meeting the adulteration of Alexandrian Senna, but as to whether when we bought Senna, we ought not fairly to demand that we should be supplied with it, and not with Argel; and he believed that by drawing public attention again to the subject of adulterated Senna, the quality would in a short time materially improve, a result which was much to be desired.

Mr. Waugh inquired whether the plant from which Argel leaves were obtained, was a native of the same districts as the Senna plants; because, in such a case, its admixture might arise from the ignorance of those engaged in collecting Senna, rather than from fraud.

Professor Bentley replied, that the Argel plant grew in certain districts where Alexandrian Senna was collected, but he thought there could be no doubt that the adulteration of Alexandrian Senna with its leaves was intentional. Indeed, Delile had stated positively that the Argel leaves were collected by the Arabs, who were fully aware of their distinctive characters, and mixed systematically with Alexandrian Senna.

Mr. Squire thought it was very desirable that we should obtain Alexandrian Senna as free from adulteration as possible. The quality of Senna for some few years had been very inferior. As to the action of Argel leaves, however, he thought further investigations were necessary before we could arrive at any positive conclusions upon their therapeutic action. The unpleasant effects attributed to Argel by Dr. Christison and others had been altogether denied by some experimenters. We should be careful in promulgating positive opinions upon such a disputed point as the action of Argel leaves. He would here notice that the resin of aloes had been commonly regarded as the cause of the griping effects of that drug, but when carefully prepared, its action was scarcely evident upon the system.

Professor Bentley said that he quite agreed with Mr. Squire, that further experiments upon the action of Argel were necessary before we could pronounce positively upon its action. As he had before noticed, some experimenters believed it to be altogether without effect, while others had attributed to it a most unpleasant action. He might mention, however, that he had himself taken a dose of decoction of Argel leaves, and the result was but little purgation, but most unpleasant griping and sickness; indeed, he was glad to take a dose of castor oil to carry off the unpleasant action of Argel. Different constitutions were probably differently affected, and the action of climate was no doubt a cause of a diversity in its action in different countries. He did not wish, however, to dwell further upon the action of Argel. It was not to consider this that he had introduced the subject of Alexandrian Senna before the meeting, but with a view to check its adulteration with Argel; for whatever might be the action of this substance, he thought when we purchased Alexandrian Senna, we ought reasonably to hope to obtain Senna and not Argel.

Mr. Hills thought that if Argel did not exactly produce griping and sickness, its action might be much less agreeable than Senna. It was very desirable that a medicine so much used as Senna should be obtainable in as pure a state as possible, which was not the case at the present time.

Mr. Brady said that, so far as his experience went, he did not find that Senna was much adulterated with Argel at the present time. Indeed, he had experienced some difficulty recently in obtaining a good specimen of Argel leaves for a museum. With regard to their therapeutic action, he might notice that these leaves were covered by a brown resinous matter, which was probably insoluble in water, and hence an infusion of Argel leaves would be less active than an alcoholic tincture.

Mr. Gale observed, that the specimens on the table which had been forwarded by him, had been obtained in the ordinary course of business as samples of Alexandrian Senna. They were all largely adulterated with Argel leaves; in fact, all the samples of Alexandrian Senna recently examined by him, were more or less adulterated with Argel. He believed that the bad quality of this Senna for the last few years was due to a falling off in the crops. In 1851, Mr. Gale said that he could not find Argel leaves in any specimens of Alexandrian Senna he examined.

The President remarked upon the uniform absence of Senna pods in the different samples upon the table. He had noticed this of late years in all samples of Senna, although formerly they occurred in some abundance. The cause of this was the fact of their being much used on the Continent as a purgative. By many they were much preferred to ordinary Senna, their action being less unpleasant. He thought it was very desirable that they should be tried in this country. Although many valuable investigations upon Senna had taken place, still there were many points connected with it upon which we were very ignorant; he thought that some one connected with the society might take up this subject for investigation with much advantage.

Mr. Palmer stated that he had occasion recently to obtain some Senna pods, in order to prepare a foreign prescription.

Professor Bentley also observed, that he had especially noticed of late years the almost total absence of legumes in the different kinds of Senna. Upon inquiry, he found that they were bought up and forwarded to the Continent, where they were much valued; in fact, they were employed in certain preparations in some of the continental Pharmacopœias. Their action had been proved to be milder than the leaflets, and they did not produce griping or sickness. He agreed with the President that, in some cases, they might be advantageously substituted for the ordinary leaflets.

Mr. Brady mentioned that the quality of Tinnivelly Senna had much deteriorated of late years. The large leaves, formerly their great distinctive peculiarity, could not be now obtained. He should like to know the opinion entertained as to the relative medicinal value of the Alexandrian and Tinnivelly kinds of Senna.

The President said that the testimony of the medical profession was in favour of Alexandrian Senna.

ÆGLE MARMELOS, OR INDIAN BAEL.

Mr. Evans, a medical practitioner from the East Indies, introduced to the notice of the meeting a preparation of the ripe fruit of the Indian Bael, under the name of Dietetic Bael. He stated that Indian Bael was highly esteemed as an astringent in India; and he thought that up to the present time it had not been fairly tried in this country. He believed that it might be advantageously introduced into the forthcoming Pharmacopœia. The present preparation, termed Dietetic Bael, was prepared by mixing the pulp of the ripe fruit with some farinaceous matter, as arrowroot. The great advantages of such a preparation were as follows:—The medicinal properties of the Bael were unimpaired, it did not injure by keeping, and it might be readily transported from India without

its qualities being in any degree deteriorated. He thought that no other preparation of the ripe fruit, which had been hitherto introduced, possessed these advantages.

Much discussion followed Mr. Evans's remarks, the purport of which was to show that many preparations of Bael had been introduced into this country, but the effects obtained by their use had not been so important as was hoped for. Mr. Pound, of Oxford Street, had long ago introduced preparations of the ripe fruit.

SPERMACETI OINTMENT.

Dr. Redwood drew the attention of the meeting to three samples of Spermaceti Ointment he had received from Mr. Hills, and made respectively with unbleached and bleached olive oil and oil of almonds. They had been kept about three months, under similar circumstances, in covered glass pots. The samples made with unbleached olive oil and with oil of almonds, were both equally sweet, while that made with bleached oil had a less agreeable odour, and afforded some indication of the commencement of rancidity. Mr. Hills wished to recommend the substitution of oil of almonds for olive oil in the formula for this ointment in the forthcoming Pharmacopœia.

ON THE IODIDE OF POTASSIUM AND COMPOUND IODINE OINTMENTS.

BY MR. HENRY HALL.

Every one in the habit of making the iodide of potassium and compound iodine ointments is aware of certain practical difficulties in the way of speedily preparing these free from objections, according to the directions of the London Pharmacopœia.

It is true that, with the expenditure of a good deal of labour and considerable time, they can be properly made by these processes; but as ordinarily sent out they are open to the objections which Dr. Garrod brought against them at a Pharmaceutical meeting in 1857,* of having a gritty character often to such an extent as to render their application to delicate skins impracticable, which shows that the iodide of potassium is not perfectly dissolved or in a state of impalpable division. In the case of the iodide of potassium ointment, the quantity of water ordered is so small, that, unless the directions of the Pharmacopœia are strictly complied with, the production of a perfectly smooth ointment cannot be depended upon.

So in the case of the compound iodine ointment, the quantity of spirit is too small to dissolve the iodide, and without much labour it cannot be so finely divided as not to have a gritty feel when the ointment is rubbed on a part. When a considerable quantity of the last-mentioned ointment is made, the difficulty of reducing the iodide of potassium to an impalpable powder becomes almost insuperable.

In the course of some experiments I have made, with the view of preparing quickly the ointments free from the objectionable grittiness, it occurred to me that advantage might be taken of the extraordinary solvent powers of glycerine, and I have found it to answer admirably. The two drachms of iodide of potassium reduced to powder I have found to be very quickly dissolved by half an ounce of glycerine; and if this solution be rubbed with an ounce and a half of lard, a perfectly smooth ointment is obtained with very little trouble. The glycerine solution mixes much more readily with the lard than an aqueous solution would. Nor is there any probability of the salt crystallizing when the

* See *Pharmaceutical Journal*, vol. xvii., p. 260.

ointment is kept as is found to be the case when it is made by the Pharmacopœia process. The iodine and iodide of potassium for the compound iodine ointment reduced to a coarse powder are still more readily dissolved by the four drachms of glycerine, and the solution mixes just as easily with the lard. This plan, I think, is a decided improvement on the Pharmacopœia process, which involves a great deal of trouble even when a larger quantity of spirit is used than the Pharmacopœia orders. The formulæ which I propose for these ointments are as follows :—

OINTMENT OF IODIDE OF POTASSIUM.

Iodide of Potassium	Two drachms.
Glycerine	Four drachms.
Lard	An ounce and a half.

Rub the iodide of potassium to powder, add the glycerine, and when the salt is dissolved mix the solution with the lard.

COMPOUND IODINE OINTMENT.

Iodine	Half a drachm.
Iodide of Potassium	One drachm.
Glycerine	Four drachms.
Lard	An ounce and a half.

Rub the iodide of potassium to powder, then the iodine being added, mix them with the glycerine, and when dissolved rub the solution with the lard.

The ointments prepared in this way are made with little trouble, and are free from the objections which have been brought against them as commonly dispensed, and so far, I think, the processes are improvements which may deserve the attention of the Pharmacopœia Committee. I may add that, when the ointments are made in large quantities, it will be found more easy to mix the glycerine solutions with the lard heated in a water bath to a creamy consistence, stirring the mixture until cold.

London Hospital, March 5, 1861.

Mr. SQUIRE thought further evidence than that which they had before them would be required to prove the advantage of the processes recommended for these ointments. The specimen of iodide of potassium ointment on the table, prepared by Mr. Hall's process, had already changed colour, although it had only been kept for a few days; and in other cases, he had observed that glycerine was not so good a preservative agent as it was sometimes represented to be.

PHARMACEUTICAL SOCIETY, EDINBURGH.

COUNCIL MEETING.

A MEETING OF COUNCIL was held in the Rooms, 51, George Street, on Tuesday, 19th March, at 11 o'clock, forenoon,

MR. J. R. YOUNG, PRESIDENT, IN THE CHAIR.

It was unanimously agreed to enter upon the minutes an expression of deep regret for the loss the Society had sustained by the death of their fellow-member, John F. Macfarlan. Active, able, and energetic, he was ever ready to assist in carrying on the work of the Society; and the Council could not but gratefully remember his labours in connexion with the advancement of Pharmaceutical education.

The meeting then proceeded to consider the appointment of a successor to the late Mr. Macfarlan, one of the Society's representatives at the Edinburgh Committee for the preparation of the new Pharmacopœia.

The CHAIRMAN proposed that Mr. James Gardner, of 58, George Street, be requested to act as colleague to Mr. Robertson, in room of Mr. Macfarlan, deceased.

This was seconded by Mr. FLOCKHART, and carried unanimously.

JOHN MACKAY, *Secretary.*

SCIENTIFIC MEETING.

The Fourth Meeting of the present Session was held in George Street Hall on Tuesday evening, 19th March, 1861, at 9 o'clock,

MR. J. R. YOUNG, PRESIDENT, IN THE CHAIR.

Before commencing the regular business of the evening, Mr. John Mackay said:—

I feel it would be unjust to those connected with this Society, did we fail to notice the loss we have sustained since our last meeting in this Hall, by the death of our much respected and esteemed fellow member, Mr. Macfarlan.

One of the founders of the Pharmaceutical Society, he has ever shown an eagerness to extend and develop its leading principles, which all now present would do well to emulate. After the recognition of our Society by the Legislature, Mr. Macfarlan became, under the Pharmacy Bill, our second President; and having been elected an Examiner of the Scottish Board, as well as a Member of the London and Edinburgh Council, he continued to act in these capacities until removed by death.

Few men have been more universally esteemed, and not only we as a Society, but the community at large, may well grieve at his departure. Privileged to be of considerable service to his fellow-citizens, his labours in this sphere were not more widely known than they were appreciated; while his long connexion with the Chamber of Commerce and Royal Medical Society will remain lasting memorials of his untiring energy and great ability. Throughout his long and useful life he has had little rest, and not till the very last, when laid on a sick bed did he cease from daily labour. The high position which the name of his firm has so long and still maintains as operative chemists, especially in connexion with the Salts of Morphia, Biberine, and other chemicals, speak of that success which his knowledge and experience so well entitle them to receive. His valuable contributions to the *Pharmaceutical Journal* are well known, while I can conscientiously say, that at all times he was willing and ready, and able as he was willing, to give his advice and assistance in anything connected with the affairs of the Society.

As you are all aware, he was associated with Mr. Robertson as one of our Society's representative members of the Edinburgh Pharmacopœia Committee, for the preparation of the forthcoming National Work, and there his presence has been most useful, and his loss deeply felt, as evinced in the following extract from a note which I received from the secretary, Dr. Charles Wilson:—

"*Edinburgh*, 43, *Moray Place*, 14*th March*, 1861.

"Dear Sir,—The Edinburgh Sub-Committee for preparing the new British Pharmacopœia, held a meeting to-day, being the first which has occurred since the death of Mr. Macfarlan, when it was unanimously agreed to enter upon the minutes an expression of the Committee's sense of the loss which they had incurred, and to intimate this to the Pharmaceutical Society, of which Mr. Macfarlan had been one of the representatives in their body. * * * *

"I am, dear Sir, yours truly,

(Signed) "Charles Wilson."

While, therefore, we cannot but deeply deplore his loss, we have the satisfaction to know and believe that, from his consistent daily walk and conversation, he has left behind him an example well worthy of imitation; and though merely by words giving expression to our regret and sorrow, yet associated with this must be a deep, heartfelt, pervading feeling, that he has now entered into *that* rest, and received *that* reward, which a Christian, good, and upright course warrant us in believing is the lot of those who, while diligent in business, neglect not due preparation for meeting calmly and peacefully that great change, which must inevitably sooner or later overtake us all.

The President, with a few prefatory remarks, introduced Dr. Littlejohn, F.R.C.S., and Lecturer on Medical Jurisprudence, Surgeons' Hall, who read the following paper:—

HINTS ON THE EVIDENCE OF POISONING.

The object of the paper was to show the importance of a knowledge of toxicology to pharmaceutical chemists, and the assistance that would thus be afforded to the authorities in the prosecution of cases of poisoning. This he illustrated under the various heads of the symptoms, *post-mortem* examination, and the chemical analysis, by reference to numerous recent cases which had come before the law courts. One important part of the evidence, viz. that relating to the possession of the poison by the guilty party (in the majority of cases procured by purchase), could alone be supplied by pharmaceutical chemists; and Dr. Littlejohn cited four cases of poisoning with arsenic occurring before the introduction of Lord Campbell's Act, where, from the clearness of the evidence given by the Pharmaceutical chemist, the crime was mainly proved. Other and more recent cases were related, in which, from the inability of the chemist to prove the purchase of the poison, a verdict was returned for the prisoner.

In conclusion, he congratulated the Society on its endeavours to raise the standard of Pharmaceutical education, endeavours which had been attended with success, and which had enlisted the good wishes of the members of the medical profession, themselves engaged in a similar struggle. The interests of the two professions were closely combined, and both must profit by their mutual advancement. What availed the most skilful diagnosis and the best laid scheme of treatment if the pharmaceutical chemists could not supply us with pure unadulterated drugs, and did not dispense these drugs with the exactitude of the chemist? Assuredly the more intelligent the pharmaceutical chemist, the more acquainted with all the characters and uses of drugs, and with the theory of prescribing, the better was he qualified to assist the medical man in the cure of disease. He, Dr. L., had ventured to point out some matters connected with medical jurisprudence, which should not be overlooked by the pharmaceutical chemist, and with regard to which he alone could give information which might prove of the utmost importance. He, Dr. L., trusted that the time was not far distant when the many opportunities afforded to the pharmaceutical chemist of cultivating his acquaintance with chemistry (opportunities denied to the medical man engaged in active practice) might bring forth fruit in medico-chemical analyses, an innovation which would be found, as in France, to work well for the public good, in the detection and prevention of crime. Lastly, Dr. L. urged upon the members the necessity of their impressing upon their assistants the importance of the duties they had to discharge to society, not merely in the dispensing of drugs, but in the cultivation of that spirit of observation which would enable them to identify the purchasers of poison.

A vote of thanks was proposed to Dr. Littlejohn for his interesting communication by Mr. George Blanshard, seconded by Mr. Stephenson, and carried by acclamation.

Mr. Mackay laid before the meeting twenty-one specimens of different varieties of Isinglass, comprehending Russian, Brazil, and East Indian. These he had much pleasure in handing to the Curators as a contribution to the Museum.

Mr. Ainslie, as convener of the Essay Committee, intimated that three Essays had been received, and that deliverance upon their respective merits would be given at the next meeting.

PROVINCIAL TRANSACTIONS.

LIVERPOOL CHEMISTS' ASSOCIATION.

The Eighth General Meeting of the Session was held at the Royal Institution on the evening of Jan. 31st, 1861,

THE PRESIDENT (DR. J. B. EDWARDS) IN THE CHAIR.

Mr. Wm. Davis was elected a Member of the Association.

The Secretary announced donations to the Library of the first six numbers of the *Technologist*, from the Editor, and the *Chemist and Druggist*, from the Editor.

A specimen of Spanish or American Moss was presented to the Museum by Mr. W. H. Samuel.

Mr. E. CLAPHAM had on the table a variety of samples of unfermented bread, biscuits, &c., made by Dr. Dauglish's patent process, having previously provided an ample supply in the library, that the members might have an opportunity of putting its quality to a practical test during the half-hour devoted to refreshment.

Mr. CLAPHAM gave a lecture "On the Oxides of Carbon, as applied chemically, gastronomically, and medicinally," in which special attention was drawn to the use of carbonic acid in making bread, and to its medicinal application, both externally and internally. The lecture was illustrated by experiments, diagrams, and apparatus; and at its close a unanimous vote of thanks was awarded to Mr. Clapham.

The Ninth General Meeting was held on Feb. 14th, 1861,

THE PRESIDENT IN THE CHAIR.

Mr. HOWARD JENKINS was elected a Member of the Association.

The SECRETARY announced the following donations:—To the Library: Copy of the "Act for Preventing Adulteration of Food and Drink," from the President; the *Pharmaceutical Journal*, from the Society. To the Museum: Samples of American Rock Oil, from Messrs. Crockett and Dawber; Specimen of Curaçoa Aloes, from Messrs. J. H. and S. Johnson; Specimen of African Caoutchouc, from Mr. N. Mercer; and Specimen of Vegetable Ivory Nuts, from Mr. H. S. Fisher.

In the unavoidable absence of Mr. H. S. Evans, who had prepared a paper "On the Adulteration of Food," it was read by the SECRETARY; after which some discussion on the general subject of Food and Drink Adulteration took place, and was brought to a conclusion by the adoption of the following resolution, moved by Dr. F. AYRTON, and seconded by Mr. W. WRIGHT:—

"That in the opinion of this Meeting, it is highly desirable that the provisions of the Act for Preventing the Adulteration of Articles of Food and Drink, be carried out in Liverpool; and that the Council of the Association be requested to forward this expression of opinion to the proper authorities."

At a Meeting of the Council held on the 20th February, it was resolved to forward the above resolution to the Health Committee of the Town Council, with an expression of concurrence of the Council in the opinion expressed in the resolution.

Similar steps have been taken by other local bodies—the Medical Society, the Social Science Association, &c.

The Tenth General Meeting was held on the 28th February, 1861,

MR. T. R. ARNOTT IN THE CHAIR.

Mr. A. H. SAMUEL was elected an Associate.

The SECRETARY announced the following donations:—To the Library: *The Chemist and Druggist*, from the Editor; *The Elaboratory laid Open* (1758), and *Pharmacopœia Londinensis* (1746), from Mr. Nathan Mercer. To the Museum: Specimen of Spanish Elderberries, said to be largely used in the manufacture of port wines, from Mr. T. Trevitt; fine Specimen of Frankincense (Abietis Resina), from Messrs. J. H. and S. Johnson.

The SECRETARY stated that the President had liberally placed at the disposal of the Council the sum of £5 5*s*., for the purpose of offering prizes for the best collection of crystals, and for the best collection of objects mounted for the microscope. The conditions under which the competition would take place had been referred to a Committee, and would be announced at the next meeting.

Mr. H. S. FISHER exhibited some dried specimens of the poisonous plants found in the neighbourhood, and made some remarks on the great importance to the Pharmaceutist of such a practical knowledge of botany as to be able to recognize medicinal or poisonous plants in their fresh state.

Mr. J. H. ELLERBECK read a paper "On Plumbago and Pencil Making," illustrating his remarks by a variety of interesting specimens.

Mr. N. Mercer read several extracts from a curious old book, *The Elaboratory laid Open*, published in 1758, and contrasted the Chemistry and Pharmacy of the present day with those of a century ago.

Before the Meeting broke up, the Secretary alluded to the donation of an old Pharmacopœia to the Library that evening, and pointed out the value and importance of a complete set of such works to their Library, requesting assistance from Members and friends in adding such copies as are deficient.

The Eleventh General Meeting was held on the 14th March, 1861,

THE VICE-PRESIDENT, MR. J. DUTTON, IN THE CHAIR.

The Secretary announced the following Donations:—To the Library: *The Pharmaceutical Journal*, from the Society; *The Chemist and Druggist*, from the Editor; *The Technologist* (No. 7) from the Editor; *Report of the Royal Institution*, for the year 1860-1, from the Committee. To the Museum: Specimen of Quillaia Saponaria or Soap Bark, and of Native Cayenne Pepper in a gourd, from Mr. H. S. Fisher; large Specimen of Crystallized Common Salt, from Mr. C. I. English. The Secretary read the rules drawn up by the Sub-Committee to which the subject had been referred, for regulating the competition for the President's prizes, stating, at the same time, that they had yet to receive the sanction of the Council, and until they had done so, could not be considered as finally settled, and would not be published; his object in bringing them before that meeting, being to elicit any suggestions that might occur to Members by which they might be improved and rendered more effectual, as the Council was always anxious, as far as possible, to carry out the wishes of the Members. The regulations appeared to meet the approval of the meeting, as no suggestions were offered for their improvement.

The President then proceeded to deliver the Lecture of the evening, "On Optics." He apologized for the introduction of some new experiments on "Magnetic Light" not strictly connected with the subject before them. These experiments were of a very beautiful character, and, as well as the numerous illustrations of the lecture by the oxy-calcium lantern, elicited the repeated applause of a large and attentive meeting.

The lecture itself was of a most instructive character, explaining the principles on which the science of optics is founded, the construction of lenses, spectacles, telescopes, microscopes, &c., and was well illustrated by diagrams and optical apparatus of various kinds. At its close, the Chairman conveyed to Dr. Edwards the thanks of the meeting for his able and important lecture.

NEWCASTLE AND GATESHEAD PHARMACEUTICAL ASSOCIATION.

In accordance with the scheme proposed at the commencement of the winter session, a series of evening meetings for the discussion of subjects connected with Pharmacy has been kept up from week to week. The following papers have been read at these meetings:—

November 8th.—"On Physic," by Mr. T. J. Howson.
" 15th.—"On Nitrogen," by Mr. B. S. Proctor.
" 22nd.—"On the Medicinal and Economic Products of the Natural Order Urticaceæ," by Mr. H. B. Brady.
November 29th.—"On the Varieties of Starch," by Mr. W. Proctor.
December 6th.—"On Perfumery," by Mr. T. Temperley.
" 13th.—"On Sulphur," by Mr. R. H. Davis.
" 20th.—"On Cohesion and Adhesion in Liquids," by Mr. B. S. Proctor.
January 9th.—"On the Manufacture of Soap," by Mr. T. Barclay.
" 16th.—"On Galls," by Mr. H. B. Brady.
" 23rd.—"On Hydrocyanic Acid," by Mr. W. Proctor.

It would be impossible to give any digest of the papers enumerated above, the mode of treatment being as diversified as the selection of subjects.

Mr. Wilson Proctor has delivered during the session an interesting course of lectures "On the Chemistry of the Metals," and the Association is much indebted to him for his voluntary services in this respect. The greatest discouragement which the Committee have to encounter arises from the thin attendance of students, and though they are willing to believe that this has arisen, partially at least, from the inclement weather, they fear that lukewarmness and indifference to the object in view is the chief cause of the deficiency.

ORIGINAL AND EXTRACTED ARTICLES.

ARE WE PROGRESSING?

BY MR. A. F. HASELDEN.

With the probable certainty of being accused of a too great love of scribbling, I would once more intrude upon the readers of this Journal a few observations upon the Pharmaceutical Society as an institution, its rise and progress, its original and ultimate objects, and also the educational branch or division of it. The objects which the founders of the Society had in view, I have always, perhaps incorrectly, taken to be as follows:—The establishing of a Society which should watch over the especial interests of Chemists and Druggists generally; to be prepared to oppose any legislation which might be injurious to them as a trading body, at the same time supporting such as might be advantageous to them and the general public; to promote good feeling and union amongst its members; by interchange of the results of individual experience to add to the general stock of information connected with their vocation; and by an additional educational course, to remove from the present and succeeding generations the stigma of ignorance and incapacity as Pharmaceutists and Chemists, when compared with members of the same trade abroad. How far this was correct, I stop not now to inquire; and, lastly, like other societies, to have attached a Benevolent Fund, for the relief or assistance of Members falling temporarily into distress and difficulties. How far have these objects, laudable in themselves, been accomplished? For nearly twenty years has this labour, partly of love and partly of interest, been carried on; love, on the side of those who delight in progress, who love knowledge and instruction for their own sakes, and who rejoice in the advancement of every good work; interest, on the part of those who look for mercantile advantages and worldly prosperity. On the one hand, if such giant strides have not been made as some might have desired, still, on the other hand, it cannot be denied that a vast progress has been accomplished, and a position gained which could scarcely at first have been calculated upon. The Chemists and Druggists of to-day, or, as I may now, more properly speaking, say, the Pharmaceutical Chemists, have, by the aid of the Society, been drawn more closely together, and have been found to be not the uninformed and unqualified class which some had thought proper to consider them, but a body having the elements to make not simply good sterling Pharmaceutists and men of business and information, but also excellent Chemists—men considered, amongst other things, worthy of assisting publicly, and not *sub rosâ*, in the production of a Pharmacopœia.

The Society has upon several occasions, through its Council, been able to divert the stream of legislation when running in a course directly opposed to the interests of the trade and the convenience of the public. The Benevolent Fund has been established, and the subscriptions, though few, regularly continued. But here let me pause and wonder at the smallness of the amounts. Surely the existence of such a fund must have escaped the notice of many with

a hand on other occasions open as day to melting charity. From nearly 2000 Members who pay the annual fee, besides Life Members and Associates, the small sum of £49 11*s.* only was subscribed, amounting to something like 6*d.* for each individual during the past year of 1860. Claims are made upon this Fund, and in all cases, when just, are relieved as far as consistent. But with so small a sum it is impossible to do as much as is desirable. It has often been urged outside that more vigour was required in the Council chamber; that new blood and young was needed, to throw its power and energy into the field of action. But in this, as in many other instances, it depends upon the individual exertion of every Member of the Society, and not upon the Council. The Council cannot beg for the Benevolent Fund, and urge continually its utility and the Christian character of its object; but every Member can say to his friend, "How is it that you do not subscribe to our Benevolent Fund?" A half-crown subscription throughout—something less than the price of a pair of French kid gloves—a single admission to the parterre of the opera, would raise the sum to more than five times its present amount; and when I think of the annual expenditure of some men upon recreation and subscriptions to different societies and charities, I blush at the absence of names on the list of our benevolent subscribers. True, and pity 'tis, 'tis true, all have many claims, but still the nearest home should have the first attention.

I have now arrived at the point which was a powerful incentive in the formation of the Pharmaceutical Society, namely, the establishing of a race of Pharmaceutists equal to any on the Continent, and worthy of a great country; and upon this particular there has been, perhaps, the largest amount of difference of opinion as to how much or how little should be done. Some still appear to think that the Society is answerable for the shortcomings of the pupils who pass their examinations, whilst others think that they acquire too much science and too little business. To me the pith of the matter lies in the fact that the Society never undertook to make or educate Pharmaceutical Chemists; but this much it did purpose, namely, to give the finishing touch to those who had, as apprentices or assistants, learnt the rudiments, and been well grounded in the general routine and business habits; and with this view every needful assistance has been given in the way of lectures—a laboratory surpassed in no institution constructed, and a well-stocked library provided to assist the inquirer or reader—and, moreover, a Journal, whose pages are open to every member, wherein he may offer his suggestions, either upon matters touching upon the general interests of the Society, or upon any subject of novelty or interest in Pharmacy or Chemistry. How far members have availed themselves of the opportunity the Journal plainly tells. The Monthly Evening Meetings were also established. Thus far the Society, with the Council as its instrument, has done the work; and I hesitate not in saying, done it well. It now remains for the Pharmaceutists of this country cordially to support the Society, and how is this to be done? Not by sitting in their easy-chairs, and looking to the Council, expecting that young and vigorous spirit to arise which they do so little as individuals to create that fresh, energetic blood, which they do not take even the trouble to propose for it is a fact worthy of observation, that nominating for new Members of Council have of late come as much, if not more, from the Council than from those without. And it would be more encouraging if members generally used their prerogative of voting at the election; if, instead of one-third of the voting papers being returned from the country, the whole were sent. Again, every one who takes an interest in the Society should seize every opportunity of making it known in his own circle of acquaintances, and of speaking well of it, as it deserves, as an institution, then, indeed, we should not so often hear that in some districts it is hardly known, and in others barely recognized. One word more in parting with my subject, which I would gladly see taken up by others.

Let us endeavour to gain the support of the daughters as well as the sons of Eve; if they can be persuaded that Pharmaceutical Chemists are better than any others, a powerful auxiliary may be added to our ranks. I feel that much that I have written has been spoken again and again; but it is still advantageous sometimes to review the past, and, comparing it with the present, ask the simple question: Are we progressing?

18, *Conduit Street*, 16*th March*, 1861.

FACTS AND FALLACIES CONNECTED WITH THE RESEARCH FOR ARSENIC AND ANTIMONY; WITH SUGGESTIONS FOR A METHOD OF SEPARATING THESE POISONS FROM ORGANIC MATTER.

BY ALFRED S. TAYLOR, M.D., F.R.S.

(*Concluded from page* 475.)

PROCESS FOR ANTIMONY.

I HAVE little to say on this subject; for nearly all that can be said is comprised in the foregoing remarks.

For the detection in, and the separation of antimony from, the *tissues*, the best plan, according to my experiments, is that which was originally suggested by Reinsch, in 1841. The antimonial compounds, when distilled with hydrochloric acid, do not readily pass over into the receiver. They are much more fixed than those of arsenic.

In the examination of the tissues of persons poisoned by antimony, I have not been able to procure by distillation with hydrochloric acid, any trace of the metal in the distillate, although antimony was readily found by Reinsch's process in the residue in the retort. If this fact should be corroborated by future inquirers, the distillation-process will furnish a ready method of separating absorbed arsenic from absorbed antimony.

In reference to the distillation of the saline compounds of antimony, I have found that, contrary to what might be expected, the metal passes over more readily into the distillate when the acid is mixed with water, than when it is concentrated, but even in this case the quantity thus obtained by distillation is very small.

EXPERIMENT 1.—One grain of tartar-emetic was dissolved in two ounces of water; three drachms of strong hydrochloric acid were added. The mixture was distilled to dryness. One third of the acid distillate gave no indication of antimony by passing into it a current of sulphuretted hydrogen gas. The other two thirds gave violet deposits on copper, coating about one quarter of a square inch of foil on both sides. It was ascertained that the greater part of the antimony still remained in the dry residue in the retort, the heat not having been sufficient to carry over the chloride.

EXPERIMENT 2.—One grain of tartar-emetic was dissolved in two drachms of pure and concentrated hydrochloric acid, and distilled to dryness. The acid distillate yielded a mere trace of antimony, by Reinsch's process—not exceeding the 1-4000th part of a grain. The residue in the retort gave an abundant white precipitate of oxychloride of antimony on the addition of water. This was immediately dissolved by a solution of tartaric acid, and the antimony subsequently precipitated, as an orange red sulphide, by passing into it a current of sulphuretted hydrogen gas. It is worthy of remark that *arsenic* passes over most readily with the strong acid; hence, if viscera are suspected to contain deposited arsenic and antimony, the arsenic may be obtained by distillation, and the

antimony separated from the organic matter in the residue, by Reinsch's process. The method of proceeding for antimony is, therefore, as follows :—

1. Boil the viscera, in a finely divided state, in one part of pure hydrochloric acid, and from four to six parts of water. Boil in a flask or retort, and condense by a funnel the acid vapour as it issues. Introduce slips of polished copper-foil (free from antimony). Continue the boiling for at least two hours before concluding on a negative result. In certain cases it may be necessary to employ from twelve to sixteen ounces of organic matter in one operation.*

2. Wash in water the pieces of copper when coated, and observe the violet or steel grey film, according to the thickness of the metallic deposit (see page 268).

3. Boil as many of the coated pieces of copper as can be collected, in a solution of pure potash, in a test tube, occasionally exposing the coated surfaces to the air. The antimony is oxidized and dissolved off by the potash.

4. Filter the potash-solution; acidulate with pure hydrochloric acid, and pass into the liquid a current of sulphuretted hydrogen gas. An orange-red sulphide of antimony is precipitated.

5. Filter the liquid and wash the precipitate. Add a few drops of solution of ammonia, and note its insolubility in this liquid. Any sulphide of arsenic is dissolved, carried through the filter, and may be found in the filtrate.

6. Again wash the sulphide, and then dissolve the precipitate in pure hydrochloric acid, taking care to boil the liquid, in order to set free all the sulphur as sulphuretted hydrogen.

7. Having mounted a tube-apparatus for hydrogen, as described under arsenic (see page 415), pour the solution of chloride through the funnel into the tube.

8. Test the gas evolved at the capillary end of the tube by a solution of nitrate of silver, and if the solution is blackened, decompose the gas by applying a red heat to the tube. Remove the tube with the metallic deposit, and gently heat it to see whether octahedral crystals are obtained; or whether, at a higher temperature, it simply forms a white amorphous oxide.

The antimoniuretted hydrogen may be in sufficient quantity to be collected in strong nitric acid. In this case the nitric acid, after saturation, should be evaporated and tested, as already described (see page 417).

Instead of decomposing the chloride by zinc, the operator may dilute it unti the water forms one tenth part, and plunge into it a slip of pure tin, free from arsenic or antimony. If, as Millon and Laveran have shown, the liquid contains antimony, even in minute traces, the surface of the tin will be sooner or later coated with a fine, black, pulverulent deposit of metallic antimony. Arsenic is not thus deposited, or there is only a slight discoloration of the tin, after some days. In the absence of antimony, the surface of the tin, after several days, presents merely a crystalline appearance.

The process above described is sufficiently delicate for all practical purposes. As a proof of this, I may mention that it enabled Dr. Miller, Dr. Edwards, of Liverpool, and myself, to procure good evidence of antimony in a liver containing not more than 1-160th of a grain in two ounces of its substance. We also employed the process successfully for the detection of free and absorbed antimony, when existing in very small quantity in sixteen separate analyses of the viscera. Three of the bodies, from which the viscera were taken, had been buried for a period of from six to nine months.

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* In one of the recent cases of antimonial poisoning at Liverpool, Dr. Edwards found it necessary to use thirty ounces of the liver, and to boil the liquid for several hours, before he obtained a clear antimonial deposit on the copper-foil.

REINSCH'S TEST FOR ARSENIC.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—Amongst the many "Facts and Fallacies" attending investigations of arsenical poisoning, so fully dwelt upon by Dr. Taylor, the process of Reinsch has been particularly alluded to. Although disadvantageous in the presence of reagents which effect the solution of the copper, its facility of application and its extreme sensitiveness have led all analysts to give it the preference wherever practicable.

One "fallacy," however, in connexion with it, has not yet been mentioned, which, though a fallacy only in appearance, and not likely to mislead experienced analysts, is sufficiently remarkable to deserve notice.

If to the dilute hydrochloric acid and bright copper foil, as usually employed in testing for metals by Reinsch's process, a few drops of solution of a pure persalt of iron be added, and the mixture boiled for a few minutes, the copper will be rapidly coated with an intense black film, the iron will be reduced to a protosalt, and the solution will contain copper. This film clings with such tenacity to the metal, that protracted ebullition with strong hydrochloric acid fails to effect its entire removal. Under the microscope it presents a surface of brilliant black metallic scales, which, under a very strong light, show a copper-coloured lustre. The analysis of a small portion carefully scraped off the foil, gave the following result, showing it to be the pure metal altered only in appearance:—.23 gr. gave .28 CuO. Theory requires .288 CuO. Eq. Cu.=31.7.

The following reaction probably occurs:—

$$Fe_2 Cl_3 + Cu = Cu Cl + 2 (Fe Cl).$$

It takes place also in the presence of organic matter.

Free hydrochloric acid is unnecessary, as the copper foil is first intensely blackened, and then dissolved in solution of perchloride of iron. This reaction has even been made the means of estimating the copper precipitated by iron in Mohr's process. Fleitman (quoted by Field in *Chem. News*, vol. i., p. 73) recommends, instead of directly weighing it, its solution in perchloride of iron, and the estimation by permanganate of potash of the protochloride of iron thus formed.

If, however, the copper, in a fine state of division, be added in excess to the perchloride of iron, the latter is almost immediately reduced to protochloride, and upon heating, much of the copper is dissolved. If the solution be filtered from excess of copper, and the filtrate poured into water, dichloride of copper is precipitated as a white crystalline powder; or if the solution be acidified with hydrochloric acid and heated, the dichloride crystallizes out on cooling in large colourless tetrahedrons.

In this case the reaction is probably as follows:—

$$Fe_2 Cl_3 + 2 Cu = Cu_2 Cl + 2 (Fe Cl).$$

This also occurs to a certain extent with copper foil, when heated in excess with the perchloride of iron.

The affinities of the two metals for chlorine appear to be singularly balanced, for, according to Proust (Gmelin's *Handbook*, vol. v., p. 438, Cav. Soc. Edit.), the dichloride of copper, treated with iron in a fine state of division, yields metallic copper and protochloride of iron. Silver in leaf also reduces the perchloride of iron to protochloride, with formation of chloride of silver (Wetzlar, Gmelin's *Handbook*, vol. v., p. 255, Cav. Soc. Edit.); but this reaction is very slow and imperfect compared with that under notice.

Persalts of iron are not singular in thus blackening copper foil previous to its solution.

Chloride of copper in solution is reduced after some days in contact with copper foil, first to oxychloride, and finally to dichloride; but if heated together

in the presence of dilute hydrochloric acid, the copper is blackened and partly dissolved. The blackening is probably more marked in this case, on account of the acid dissolving the oxychloride from the surface of the foil as soon as formed.

Permanganate of potash, bichromate of potash, peroxide of lead, perchloric acid, and hypochlorites, also give analogous results.

It will thus be seen that the reagents which effect the solution of the copper are not by any means limited to the chlorates.

I may mention, too, a singular fact with regard to Reinsch's test that occurred to me some time ago when using it for the examination of an organic mixture, in which lead was contained in very small quantity. The whole of that metal was found on the copper after half an hour's boiling, and twenty-four hours' subsequent standing in the liquid.

M. Lippert's researches on the arsenical deposit obtained in this process (*Journ. für prakt. Chem.*, lxxxi., p. 172), which prove it to be a definite alloy, having the composition Cu 5 As, give a key to its sensibility, and show that its theory has not hitherto been thoroughly investigated and understood.

I am, Sir, yours obediently,

Worthing, March 18*th*, 1861. EDW. C. C. STANFORD, F.C.S.

THE CASE OF POISONING BY ARSENIC NEAR WAKEFIELD, WITH REMARKS UPON DR. TAYLOR'S NEW PROCESS.

BY R. REYNOLDS, F.C.S.

THE *Pharmaceutical Journal*, for November, 1860, contains a report of the proceedings before the Wakefield Bench of Magistrates, against Emma Stringer, who had lived as domestic servant with the deceased Miss Adamson.

The case was invested with an especial interest on account of discrepancies in the reports of the analysts engaged upon it. The medical man who made the *post-mortem* examination after the first exhumation, stated in evidence before the coroner, that he had used Reinsch's test without discovering arsenic.

The Home Secretary required the re-exhumation of the body, which was done under the supervision of Thos. Nunneley, Esq., F.R.C.S., of Leeds, who undertook the chemical analysis, which resulted in the detection of arsenic in all the viscera examined, including the brain and uterus, in addition to those ordinarily employed for such investigations.

I was present during the greater part of these analyses simply as a friend of Mr. Nunneley. It may be as well to state here that the solicitor for the prosecution insisted upon subpœning me as a witness at the assizes. It must often have occurred that the analyst, in any case of poisoning, has received visits from his scientific friends, who may with equal probability have rendered such assistance as would be practically useful where several operations were in progress. But I am not aware of any instance in which such individuals, having no professional connexion with the case, have been summoned *nolens volens* as witnesses upon the trial. It is as well, however, for them to know to what they are liable.

Under the circumstances of the conflicting chemical evidence, it appeared desirable to the prosecution to strengthen their case by bringing additional testimony of the presence of arsenic. At the conclusion of Mr. Nunneley's analysis, there remained portions of the following viscera, viz. liver, kidney, lungs, and small intestines.

At the end of November, three months after the death of Miss Adamson, I made an independent analysis of the above-named tissues. By Reinsch's test, clear evidence of arsenic was obtained in each case, that substance being tracked through its conditions as metals, arsenious acids, and its combinations resulting from the three liquid tests.

The fact that similar quantities of the copper-foil, hydrochloric acid, and water, to those employed in the experiments, did not, when boiled together for a similar time, give any deposit upon the copper, was also proved. I also treated several slips of the copper with stronger hydrochloric acid for some days, with partial exposure to the air. The metal was essentially dissolved, a fragile black skeleton of the original form only remaining. This was washed, dried, and heated in a small tube. Not a trace of the so-called alliaceous odour could be detected, nor were any crystals volatilized. Now, unless the fact (if it be a fact) that arsenic is always present in all copper is to banish Reinsch's test from the regions of medical jurisprudence, whether as a positive proof or a means of corroboration, I conceive that such an examination of the copper as has just been detailed, has its value in proving that any arsenic found did not take its origin in the materials employed. It is difficult to prove a negative; and a barrister engaged on the other side would probably be but little open to conviction. The peculiar odour of volatized arsenic is so striking in the most minute quantities, that it may no more be neglected than the exercise of the sense of vision in noticing the colour of the precipitate caused by the liquid tests. For the same reason I should consider that, in the search for strychnia, an absence of bitterness in the matters examined would be conclusive evidence against the presence of that substance.

The following application of Marsh's test was then made. Half of one of the kidneys, weighing with its attached fat two ounces, was cut up and heated upon the water-bath. As the liquefied fat interfered with its desiccation, it was freed from this by pressure in a piece of linen. After drying further, pure sulphuric acid was added, and the whole evaporated to dryness on the sand-bath, with constant stirring—an operation involving some hours' time. A small quantity of aqua regia being added, it was again dried, heated with water twice and filtered. A similar quantity of the aqua regia being evaporated to dryness was tested for arsenic acid by nitrate of silver, with negative results.

A half-pint Woolfe's bottle, fitted for Marsh's test, was now set in operation, and the flame repeatedly tested for arsenical stains, none of which resulted. The few drachms of nearly colourless fluid from the kidney being poured into the apparatus, a few seconds sufficed to give brilliant metallic stains, with hair-brown coloured margins upon the porcelain. Some dozens of such stains were collected. These deposits were soluble in hypochlorite of soda, and when oxidized by aqua regia gave to nitrate of silver the characteristic brick-red deposit. From the perfect success of the foregoing application of MM. Flandin and Danger's carbonization process, I cannot but regard it as deserving more general employment than it has enjoyed.

The objections to it have doubtless been due to a too decided appreciation of the time and trouble involved in careful carbonization, and also to the fact that the authors admit a loss of 10 per cent. of arsenic. But it should be recollected that their experiments showed a loss of from 40 to 80 per cent. as resulting from the use of the other carbonization processes; and since Dr. Odling's discovery of the inevitable loss of chloride of arsenic which occurs when hydrochloric acid is heated for some time with arsenical tissues, we must conclude that the objections to such modes of carbonization as employ that acid are stronger than before. A loss of even 10 per cent. of arsenic is, doubtless, to be regretted; but it ought not to cause us to throw aside as worthless an auxiliary to Marsh's process, which in other respects accomplishes its object efficiently. Further refinements of analysis may ultimately enable us to do this, but at present we must make the best selection amongst existing processes.

The publication of Dr. Taylor's historical sketch, entitled "Facts and Fallacies connected with the research for Arsenic and Antimony," &c., now came under my notice. I believe that Dr. Taylor is entitled to the thanks of chemists

for this *résumé* of the various processes proposed from time to time; and unless I am much mistaken, he will also receive their sympathy in the personal question involved by the error into which he fell in Smethurst's case. Surely scientific men can express their differences of opinion, without charging one another with being the instrument of "judicial murder." Dr. Taylor's reply to his censor appears to be a merited and crushing application of the *tu quoque* line of reasoning. Dr. Taylor's error arose from the assumption that he could meet the difficulty caused by the action of chlorate of potash upon the copper, by permitting this power to exhaust itself. The inventive faculty involved in thus applying an entirely new step in an old process should certainly have been accompanied by the consideration of what possible objections might exist to the use of such new process.

But Dr. Taylor concludes his essay by the announcement of a new method especially adapted for the elimination and detection of arsenic combined with the tissues. This was just what was required in the case in hand. I could spare two ounces of the liver for use in the new experiment. This was cut up and dried as far as possible on the water-bath, although those who have attempted the perfect desiccation directed in this and other processes, will know that the amount of fat often present renders the drying merely comparative. It was then introduced into a small flask, covered with hydrochloric acid, and heated upon the sand-bath, a bent tube of two to three feet in length conducting the distillate into another flask. When a considerable amount of acid had passed over, the evolution of incondensible gases became violent and irregular, and the products of this semi-destructive distillation were highly offensive. Any inattention to the regulation of the experiment, which occupied some hours, would have resulted in the bursting of the apparatus, or in its being left in a condition so far from close, that confidence in the results would have been greatly impaired. Fresh hydrochloric acid was added, and again distilled off, until a partially charred mass only remained. Neither the distillate nor the residue gave satisfactory proofs of arsenic with Reinsch's test. A discoloration of the copper by the former might be explained by the offensive sulphur compounds resulting from the decomposition of the protein matters which had been accomplished. It may be stated here that two ounces of the liver treated by Reinsch's test simply, was sufficient to unmistakably coat with arsenic many square inches of copper. The lower side of the condensing tube was covered with sublimed fatty acids, retaining portions of the liquid distillate.

The distillate in the flask was now submitted to Dr. Taylor's second stage of operations. A small bottle was fitted with a funnel, exit tube, chloride of calcium tube, and delivery tube with three or four contractions. A piece of lead-paper was introduced into the chloride of calcium tube to arrest any sulphuretted hydrogen, and a little zinc being put into the bottle the acid distillate was added with some water. The delivery-tube dipped into a strong solution of nitrate of silver, through which the evolved hydrogen was conveyed. In a few minutes a very faint trace of brown colour appeared in the nitrate of silver, which, however, was not increased by continuing the operation for half an hour. The horizontal tube was heated by the spirit lamp as soon as this colour appeared. A very faint stain appeared at one of the contractions, and the attempt was made to duplicate this at another point. No other deposit could be got, but by this time the vapour of the hydrochloric acid had dissolved and carried off the first trace. In this result we see the advantage of sulphuric over hydrochloric acid for the elimination of hydrogen. The chloride of calcium could not be depended on for absolutely drying the gas, whilst the very decided blackening of the lead-paper showed the presence of so much sulphur, that the slight brown tinge given to the chloride thrown down in the nitrate of silver, was quite as likely to be due to sulphur as to arsenic. The use of strong nitric acid to collect the arsenic, was of course not tried.

That the conversion of chloride of arsenic to hydride was effected perfectly when small quantities of the latter were purposely added, was then shown. The twentieth part of a grain of chloride of arsenic in solution being poured into the apparatus, gave a most abundant dark brown deposit.

My conclusions regarding the new process are, that it is more tedious than older methods which accomplish the same object better, as, for instance, that of MM. Flandin and Danger; that it is liable to interruptions by accident during distillation; that the sulphur set free during the distillation is a source of inconvenience afterwards; that the hydrochloric acid is inferior to sulphuric acid for the production of arseniuretted hydrogen; and, chiefly, that the distillation does not eliminate all the arsenic in the form of chloride. If Dr. Taylor does not consider that any of the multitudinous processes proposed from the time of Marsh downwards, have stood the test of practical application, he will doubtless anticipate that objections will be raised to his latest addition to the long list.

As my object in the experiment was more to test the process by the practical case then in hand, rather than to test the tissues by the process, its failure was immaterial.

The perfection of the results by Reinsch's and Marsh's methods left no doubt about the presence of arsenic, entirely confirming Mr. Nunneley's experiments. As to the quantity of arsenic, I do not pretend to guess it, for in the case of combined arsenic and a very limited amount of the reserved viscera, the quantity dealt with was necessarily minute, and any calculations based on amounts present in a fragment of an organ would still involve presumptions that the poison was equally diffused through the tissues of that organ.

In conclusion, the prisoner was brought up for trial, at the Winter Assizes in York, before Mr. Justice Hill. The grand jury occupied between two and three hours in the examination of the witnesses for the prosecution, all of whom were called. They then brought in a return of "No bill," and the case was discharged. It was not generally anticipated that when tried by the common jury, the prisoner would be convicted, because of flaws in the evidence connecting her with the possession of the poison. Still it was felt that the grand jury, by stopping the case, had exceeded their legitimate functions, and that their investigation of witnesses singly and privately, partook more of the nature of a Star Chamber inquiry than of an English court of law.

Had Smethurst's case been treated in the same manner, he would not have been put upon his trial. Some animadversions in the public prints were called forth by the proceedings. The irresponsible character of investigations by grand juries is certainly deserving of attention.

Leeds, March 19, 1861.

REPORT OF THE
RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION,
AND OF THE
APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

On Butyric Acid Fermentation.—M. L. Pasteur has been continuing his valuable and important investigations on Fermentation, and has just presented to the French Academy a very curious result. The various products formed during the so-called lactic acid fermentation are well known. Lactic acid, a gum, mannite, butyric acid, alcohol, carbonic acid, and hydrogen, appear simultaneously or successively in extremely variable proportions, and very capriciously. M. Pasteur states that he has been slowly led to the recognition of the fact that the vegetable ferment which transforms sugar into lactic acid, is different from that of those (for two exist) which determine the production of the gummy matter; and

that the latter, in their turn, do not generate lactic acid. He has also ascertained that these several vegetable ferments cannot under any circumstances, if in a pure state, give rise to the formation of butyric acid. It follows, therefore, that a distinct butyric ferment must exist. After a long research the author has succeeded in detecting this body. *He finds that the butyric acid ferment is an infusorial animal.* The author for a long time took pains to remove and exclude these little animals, from the idea that they were feeding upon the vegetable substance which he supposed was the butyric ferment, and which he was seeking to detect in the liquid media he employed. But failing by that means to ascertain the cause of the origin of the butyric acid, he began to perceive an inevitable coincidence between the infusorials and the production of this acid; a circumstance which he had previously attributed to the peculiar fitness of butyric acid to the life of these animalcules. After this observation, however, a great number of experiments convinced him that the transformation of sugar, of mannite, and of lactic acid into butyric acid was due exclusively to these infusorials; and that they must be regarded as the true butyric ferment.

M. Pasteur describes these animals as small cylindrical bodies, rounded at their extremities, generally strait, isolated, or joined in chains of two, three, or four members, and sometimes even more. Their width is about $0.^{m}002$. The length of the isolated member varies from $0.^{m}002$ to 0.015 or 0.02. They advance with a sliding motion. During this movement their bodies remain rigid or undergo slight undulations. They turn round, swinging or rapidly vibrating the anterior and posterior parts of their body. The undulations of their movements becomes very evident when they attain to the length of $0.^{m}0.15^{m}$. They are often curved at one of their extremities, sometimes at both. This peculiarity is rare at the commencement of their life. They are reproduced by the simple division of the parent, which accounts for their being sometimes joined in chains.

These infusorials may be grown or increased as we grow yeast of beer. They multiply themselves if the medium is appropriated to their nourishment. It is observed also, that in a liquid containing only sugar, ammonia, and the phosphates, crystalline, so to say mineral substances, they reproduce themselves correlatively to the butyric fermentation, which soon becomes very manifest. The weight of the amount formed is notable, although always small, compared to the total quantity of butyric acid produced.

The existence of infusorials possessing the character of ferments, is a fact sufficiently worthy of attention; but it is accompanied in this case by a singular peculiarity. It is that these animalcules live and multiply to infinity without being furnished with the least portion of air or free oxygen. M. Pasteur has demonstrated this curious fact by numerous experiments, which have proved satisfactory to those members of the Academy who witnessed them. But he goes further. He states that these infusorials not only live without air, but that air kills them. If a current of carbonic acid be passed through the liquid in which these animals are living and generating, they are not in the least affected; but if a current of air be substituted for the carbonic acid, they all perish within a couple of hours, and the butyric fermentation which depends on their existence is at the same time arrested. We obtain, therefore, this double proposition:—1*st. The butyric ferment is an infusorial animal.* 2*nd. This infusorial lives without free oxygen.* This appears to be the first example of an animal ferment, and also of an animal living without oxygen.

The close connexion which is thus presented between the mode of life and properties of these animalcules and the mode of life and properties of the vegetable ferments, is still occupying the attention of the author.

On the Root of the Kawa.—The *Piper methysticum* is a plant inhabiting the islands of the Pacific. It is known to the Tahitians by the name *awa* or *kawa*, and is cultivated by them for the purpose of preparing from it an intoxicating drink. M. Cuzent has published * an account of this plant, and the results of an examination of the beverage prepared from its roots by the above race.

The Piper methysticum, he states, is a shrub, the root of which weighs from 1 to

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* *Journal de Pharmacie*, March, 1861.

2 kilogrammes, but often attains to 10 kilogrammes and even more. By drying this root loses 55 per cent. of water, becoming very light, and assuming a yellowish colour. Chewed in the fresh state, it is at first mild and aromatic, but becomes bitter, sharp, and biting to the taste. It provokes an abundant flow of saliva, and after some minutes a sensation of burning. The leaves are membranous, patulous, and extremely emarginate. The flowers are dicœcious, and disposed in long axillary catkins. The fruit is a monospermous berry.

The Tahitians count no less than fourteen varieties of kawa; but the characters which they assign to these varieties are principally founded on the intoxicating qualities of the roots.

To prepare the kawa liquor, the young girls chew or mince the fresh roots, so as to break up the fibrous tissue and form a homogeneous paste. The different portions thus prepared are collected in a large wooden dish, and mixed with a definite quantity of water. By gentle pressure with the hand, the ligneous portion is then separated and removed. The drink is served soon after its preparation, and without its ever previously undergoing the least fermentation. The taste of this liquid is at first sweet, then it becomes piquant and sharp. Its effects are rapid. When concentrated, drunkenness is almost instantaneous; with the ordinary dose, it occurs about twenty minutes after ingestion. In several islands the kawa is a daily drink, analogous to our tea or coffee, and of which every native partakes. The liquid is interdicted to women and children. In a small dose kawa is a tonic stimulating beverage, producing an agreeable excitement, and affording support against great fatigue. In increased doses this root determines an intoxication of a sorrowful, silent, and sleepy character, completely different from that produced by alcoholic drinks. The habitual drinkers of kawa take it six or eight times a day; but then a nervous trembling seizes them, and they can scarcely raise the cup to their lips. The root of the Piper methysticum contains an essential oil of a citron yellow colour, a large quantity of starch in small rounded granules, and a particular neutral principle named *Kawahine*. It is probably to this principle that should be attributed the stupifying and intoxicating properties of the kawa. The kawahine is obtained by treating the coarsely powdered root of the plant directly with alcohol in a displacement apparatus. The yellow liquor obtained is filtered, concentrated by distillation, and allowed to crystallize. The crystals which form are collected and purified by animal charcoal, and recrystallization from a spirituous solution. It is deposited in white tufts of slender prismatic crystals, resembling sulphate of quinine in their lightness, freedom from colour, and crystalline form. Kawahine is unchanged in the air, and without odour. It fuses between 120° and 130° cent. It is insipid, very little soluble in cold water, soluble in boiling water, from which it crystallizes on cooling. Its solution is neutral to test paper, and it is incapable of combining with acids and forming salts. It cannot be regarded, therefore, as an alkaloid.

It contains no nitrogen. Its centesimal composition is carbon 65.847; hydrogen, 5.643; oxygen, 28.510. It is freely soluble in alcohol, ether, and the acids.

ON THE USEFUL PLANTS OF PARAGUAY.

BY DOMINGO PARODI.*

The brief notes on the useful plants of the neighbourhood of Assumption, which I had the honour of remitting to the Pharmaceutical Association of Buenos Ayres, may have given some idea of the innumerable species susceptible of medicinal or industrial application, which must be contained in the vast territory of Paraguay. I have continued to occupy myself in making a special study of this department of applied botany, endeavouring especially to ascertain the Spanish names of the families and genera of our useful plants, as well as their Guarani names, which latter, as may be supposed, have not the slightest analogy with either

* Catálogo alfabético Guaraní-Castellano de las plantas indígenas ó naturalizadas en el Paraguay, con la referencia á las familias naturales á que corresponden, con notas sobre sus aplicaciones á la terapéutica y á la industria.—*Revista Farmaceutica de Buenos Aires*, Oct., 1860.

the popular or scientific names which we give them. As I am unacquainted with any special treatise on the Botany of Paraguay, I have been obliged to examine each plant in order to determine its family, which done, it has not been in my power always to give genus and species, for want both of sufficient botanical knowledge and of the general works indispensable for the purpose. I trust this essay, which, though small and incomplete, has nevertheless cost some labour and patience, may offer a means of estimating the actual value of the exaggerated medicinal qualities attributed by empirics to a number of plants *(yuyos)* which are for the most part inert. The indication of the natural family to which they belong may give a probable idea of the properties of the species. Moreover, I believe this Catalogue may be of service to any physician visiting this country, who may wish to make use in his practice of the numerous pharmaceutical products which are of spontaneous occurrence.

Abati (Guarani), *Maiz* (Spanish); Nat. ord. *Gramineæ*, genus *Zea.*—Maize and Sweet Cassava (*Manihot Aipi*) form almost exclusively the food of the inhabitants of the rural districts. With pounded maize a kind of bread called *Chipá* is prepared. *Locro* is pounded maize boiled with fat and water. The fermented beverage known as *Chicha de Maiz* is not used in Paraguay.

Abati-guaycurú, a variety of Maize, described by Azara.

Abatí-yú (Guar.), *Maiz del agua* (Span.); Nat. ord. *Nympheaceæ*, genus *Nelumbium.*—In the lagoons and valleys of the port of Assumption is found this magnificent aquatic, the leaves of which, two to three feet in diameter, are accompanied by a flower of a rosy white, to which succeeds a fruit having six to eight seeds. This fruit is farinaceous, and when cooked in the embers, eatable. Hence its name, *water-mazie.* In Corrientes it is called *Irupé* (*i.e.* great-dish), from the form of the leaf.

Abatí-timbabí (Guar.), *Arbol resinoso* (Span.).—The transparent ornament which the Caainguas Indians wear hanging to the under lip is made of the resin of this tree. The resin which resembles copal may be used for the same purposes as that substance.

Abayí-bacué (Guar.), *Batata* (Span.); Nat. ord. *Convolvulaceæ*, genus *Convolvulus.*—Gigantic varieties of the Sweet Potato described by Azara.

Agxapé-guazie (Guar.), *Camalote* (Span.); Nat. ord. *Hydrocharideæ.*—The flowers of the *Camalote* are used in infusion as diuretic, emollient, anaphrodisiac, and sedative.

Aguará-ibá, *Aguará-ibá-guazú* (Guar.), *Lentisco* (Span.); Nat. ord. *Terebinthaceæ*, genus *Pistacia.*

Aguará-mihubá (Guar.), *Molle* (Span.); Nat. ord. *Terebinthaceæ*, genus *Schinus.*—From the different species of Aguará-ibá (literally *fox-fruit*), which all contain a resinous, aromatic juice, is prepared the much esteemed Mission Balsam, of which the Jesuits send annually a certain quantity to the Spanish court, and to which great medicinal virtues are attributed. To prepare it, the leaves and thin twigs of the tree are broken small and boiled in wine. When the wine has extracted all the soluble matter, it is strained and evaporated to the consistence of an extract. Of the green leaves, twenty-five pounds furnish one pound of balsam. Though not possessing the extraordinary virtues attributed to it, the balsam is certainly a good medicine when applied externally in cases of rheumatic pains, bad ulcers, wounds, &c. It is said to be useful also in hæmoptysis and fluxes of the bowels, which is probable, considering its astringent and resinous nature. In these cases it is taken in pills of six to eight grains frequently repeated.

Aguapé (Guar.), *Camalote* (Span.); Nat. ord. *Pontederiaceæ*, genus *Pontederia.*—Decoction of flowers used as sedative and anaphrodisiac; leaves eaten by cattle.

Aguaí-guazú (Guar.), *Arbol del Estoráque* (Span.); Nat. ord. *Styraceæ*, genus *Styrax.*—This tree contains an aromatic resin, which is collected by incision like benzoin. From the fresh bark is prepared a balsam like that of the *Aguará-ibá*, and possessing analogous properties. The ripe fruit emits a pleasant aroma.

Aguaí mi (Guar.); Nat. ord. *Sapotaceæ*, genus *Achras;* popular name, *Mata ojo.*—Fruit contains a milky juice of bitter, disagreeable taste. A sweet conserve is, however, prepared from it, after it has been boiled in several waters.

Amambay, *Amambay-guazú* (Guar.), *Helecho* (Span.).—Ferns of the genus *Polypodium*, used in decoction as astringents.

Amambay-mini (Guar.), *Culantrillo* (Span.).—A species of *Adiantum*, employed chiefly as an emmenagogue.

Andaí (Guar.), *Zapallo criollo* (Span.); Nat. ord. *Cucurbitaceæ*.—The seeds of this plant possess the same tænifuge properties as those observed by Señor Podesta in the *Zapallo* of Buenos Ayres. I have used them twice with complete success.

Apeterebí-morotí, a species of *Cordia?*—Wood white, hard, and tough, used for ships' masts and yards.

Apeterebí-tupí, *Apeterebí-hú* (Guar.), *Sasafrás* (Span.); Nat. ord. *Laurineæ?*—The timber of these trees, known as *Yellow* and *Black Sassafras*, is used in building. The wood is also employed as sudorific and antisyphilitic. Supposed also to expel nephritic and vesical calculi.

Anday-varó (Guar.), *Zapallo amargo* (Span.); Nat. ord. *Cucurbitaceæ*, genus *Cucumis*.—Drastic purgative.

Anangá-piri (Guar.), *Mirto blanco* (Span.); Nat. ord. *Myrtaceæ*, genus *Myrtus*.—Fruit edible.

Arachichu (Guar.), *Yerba mora* (Span.); Nat. ord. *Solanaceæ*, genus *Solanum*.—Possesses sedative and narcotic properties.

Arachichú-pochí; Nat. ord. *Apocyneæ*, genus *Strychnos*.—Juice and seeds poisonous.

Araticú-mi, *Araticú-guazú* (Guar.), *Chirimoyo* (Span.); Nat. ord. *Anonaceæ*.—Fruits edible.

Arazí-guayrá (Guar.), *Guayabo* (Span.); Nat. ord. *Myrtaceæ*, genus *Psidium*.—The fruits are eaten; jellies and conserves are prepared from them.

Ayunandy (Guar.); Nat. ord. *Laurineæ*.—Timber for building.

Bocayá (Guar.), *Coco* (Span.); Nat. ord. *Palmæ*, genus *Elæis*.—From the fibre of the leaves cord is made; also woven fabrics, fine, flexible, and strong. The upper part of the trunk contains a farinaceous substance, used as food when there is a scarcity of cassava. The kernel of the fruit, of the size of a large almond, contains half its weight of a sweet edible oil, congealing at 60.8 F., and yielding under pressure a considerable quantity of stearine fit for candle-making, while the oleine may be used for manufacturing soap or for the lubrication of machinery. The natives eat the oily seed and chew the fibrous pulp, which latter, from the small quantity of saccharine matter which it contains, produces alcohol by fermentation, as is the case also with the sap of the tree.

ON COAL-GAS.

BY THE REV. W. R. BOWDITCH.

A DISTINGUISHED Fellow of the Royal Society discovered coal-gas, when Rector of Crofton, about two miles from my present parish, and nearly all our knowledge of this complex substance is derived from the labours of chemists who have been, or are, Fellows of the Society. I feel assured, therefore, that an attempt to extend the knowledge of the reaction of coal-gas with various substances will be favourably received, and that the application to practice of the facts made known, will not render a memoir less acceptable to the Society which rewarded alike the abstract researches of Leverrier and the practical ones of Arnott.

Six years ago I introduced the use of clay into gas-works, for the purpose of improving the purification of coal-gas, and now,—after so long an experience, the purification of many hundreds of millions of feet of gas, and the use of many thousand tons of the refuse as manure,—I venture, for the first time, to submit the grounds upon which my process is based.

Coal-gas may conveniently be considered under the heads of carbon compounds required for the production of heat and light, which generate water and carbonic acid by their combustion; and sulphur and nitrogen compounds, which are not necessary for heat and light, and ought to be removed from gas on account of the injurious nature of the substances produced by their combustion.

The former of these classes will be treated of incidentally; the latter class forms the principal subject of this paper. When speaking of *gas*, I always refer to that

which has undergone the ordinary condensation of gas-works, wherefore no mention is made of the complex compounds removed by condensation.

When coal is distilled, its nitrogen is evolved in some forms of combination which are generally familiar, while others are almost unsuspected. Under certain conditions of distillation, much nitrogen leaves the retorts and passes the condenser as ammonia or some of its salts. These are all removed from gas by clay, so that no trace of ammonia can be discovered after gas has passed through purifiers charged with an adequate quantity of clay, and with lime or some equivalent substance to remove sulphide of hydrogen. Clay is thus entitled to be classed with acids and some metallic salts as a purifier of gas, for these, of course, remove ammonia and its salts. But between clay and acids there is an important difference, in regard to the action which takes place upon the most valuable light-giving constituents of the gas; acids remove a large quantity of these, clay does not. We have experimental proof that clay does not remove the valuable hydrocarbon vapours from gas, in the fact that strong spirit of wine digested upon foul clay for days, does not thereby become much more luminous than it was before being so treated. The very slight light-giving power which it has obtained is due to tar; for if the spirit be evaporated, and the tar so obtained be redissolved in fresh spirit, the same kind of flame will be obtained as before, whereas the addition of a small portion of coal-oil to spirit gives a flame of considerable illuminating power. To this I may add, that long and extensive experience shows that the employment of clay in the purifying process improves the light-giving power of gas, by removing substances which are not otherwise removed, and which, if allowed to be burnt with the gas, lessen its illuminating power. These light-damaging compounds are produced during the latter portion of the distillatory process, as I have proved by experiment. The same retort was charged twice with the same weight of the same coal. The gas produced by one charge was purified by lime only, that produced by the other charge was purified by lime and clay. The illuminating power of the gas passing at each half-hour's end was determined, and it was found that the purification made no difference for the first three or four half-hours. About the middle of the charge, that purified by my process had slightly the advantage, and at the close the difference in favour of that purified by the addition of clay has been found as much as ten or twelve per cent. Thus it is shown that the compounds removed by clay from gas produced during the early stages of distillation—however objectionable on other accounts—do not lessen the light-giving power of gas, whereas those removed during the later periods of distillation reduce the light-giving powers considerably.

If conjecture be allowable, I would venture an opinion that cyanogen compounds, and other nitrogenized substances with which foul clay abounds, are those which lessen light. My own investigations lead directly to this inference, and, I think, explain an old Table by Dr. Henry in this sense. In the "Philosophical Transactions" for 1808, he shows that the gas produced from 112 lbs. of Cannel-coal contained, after purification, the following quantities of nitrogen:—

Hours from commencement of distillation.	100 measures of purified gas contain measures of nitrogen.	
½ an hour.....	20	Due chiefly to atmospheric air.
1 hour	4¾	Probably the time when ammonia was principally produced.
3 "	5	
5 "	15	Probably vapour of water was present in very small quantity, and cyanogen and related compounds were produced in increasing quantity.
7 "	15	
9 "	15	
10½ "	20	
12 "	20	

Without assuming the absolute accuracy of these figures, we may regard them as valuable indicators, pointing, I think, in the direction I have ventured to conjecture.

A beautiful reaction furnishes experimental proof of the damage done to gas by

acids. Clean deal sawdust is well moistened with pure sulphuric acid, diluted with five or six volumes of water, so that the sawdust may not be discoloured, and gas is passed through it in a slow stream. With rich gases, which give the light of from 20 to 25 sperm candles for a consumption of five feet an hour, the sawdust instantly changes to a most beautiful pink colour, and the tint gradually deepens until the whole becomes of a dark mahogany. With poor gases, which give the light of from 10 to 12 candles, this coloration is exceedingly faint at first, and deepens very slowly. The differences of coloration are so considerable and constant, that I have no doubt of the possibility of thus determining the value of gas as an illuminant. By using a standard acid, the same kind of sawdust, a uniform volume of gas, and the same sized U-tubes, notation of time and depth of colour would give a close approximation to the illuminating value of the gas. At all events, the sources of error are not greater than those of photometry in the hands of all but the most experienced, and the process is quite as close an approximation to truth as an ultimate analysis of gas, containing, as it does, impurities which render skill and precaution useless. A comparison of the analysis of coal-gas given in "Bunsen's Gasometry," with the substances now known to exist in gas, will convince us that at present we cannot attach any value to such analyses.

To determine the substances in gas which produce this coloration, some of its chief illuminating constituents were prepared and passed separately through the acid sawdust.

Olefiant gas made in the usual manner, and carefully purified, reddens the acid sawdust. Ether vapour does not affect it, and therefore need not be removed from the gas for this experiment.

Propylene, produced by passing the vapour of fusil-oil through a red-hot combustion-tube filled with cast-iron nails, but kept at so low a temperature that a small portion of oil passed over without decomposition, reddened the acid sawdust.

Commercial benzole, with the exception of one specimen, reddened the acid sawdust.

I have not yet had leisure to prepare and test acetylene.

The coloration of fir-wood moistened by hydroehloric acid, has been mentioned by Williams as characteristic of pyrrole.

To show that the colour was produced by illuminating matter abstracted, some sawdust was treated with aeid strong enough to char it slightly;* and gas, which instantly reddened the clean sawdust and dilute acid, was passed first through the black and then through the clean acid sawdust. No colour was produced in the latter, though the flow of gas continued for an hour.

Hydrochloric may be substituted for sulphuric acid, so far as that gas colours sawdust moistened with it, but it is liable to a considerable disadvantage. If gas contain ammonia, the vapour of the acid unites with it in the tube before the gas comes into contact with the sawdust, and the result is a deposit of chloride of ammonium on the surface of the sawdust where the colour commences, which renders the observation less precise and easy. Olefiant gas likewise does not redden this acid sawdust, and therefore cannot be estimated by it.

Nitrogenized compounds in coal-gas present the greatest difficulty in the way of efficient purification, and the almost impossibility of obtaining them in a state fit for examination, renders their investigation laborious and unsatisfactory. Much nitrogen is contained in gas as cyanogen, which can be separated from the clay used in purification. Probably not much less exists as sulphocyanogen, which can be separated from the foul clay with ease, and the presence of further quantities in combination with sulphuretted hydrocarbons and tar can be demonstrated. The bodies formed by this combination of elements are, I believe, unknown at present.

By placing clay in a purifier through which crude gas passes from the condenser of a gas-works, and treating the saturated clay with spirit, a solution is obtained, of a brown colour, which has no effect upon litmus, turmeric, or lead-paper, which decolorizes a solution of iodine, and from which nitrate of silver throws down a white or brownish white precipitate, and acetate of lead a white precipitate. The

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* This acid was of the same strength as that used in some gas-works.

aqueous solution possesses the same properties, and, like the solution in spirit, is always neutral. Litmus paper, immersed in either of the solutions and exposed to the air, becomes quickly, strongly, and permanently reddened. Soluble sulphides have been tested for repeatedly with nitroprusside of sodium, as well as with acetate of lead, but have never been found; yet a sulphur compound exists in solution which possesses the power of forming a sulphide with metallic mercury. The spirit solution, digested on mercury, with occasional shaking, produces the black sulphide of mercury, while the aqueous solution, similarly treated, produces the red sulphide. Insoluble sulphides, however, exist in the foul clay, and evolve sulphide of hydrogen on the addition of an acid. These insoluble sulphides are oxidized rapidly by exposure of the clay to atmospheric action.

A solution of clay in spirit was treated with an excess of powdered acetate of lead, and the white precipitate filtered off. The brown filtrate was supersaturated with ammonia and filtered. The clear brown filtrate, diluted with twelve times its bulk of water, became milky, and with much difficulty was obtained clear by filtration. Part of the spirit was then distilled off, to ascertain whether it would bring over a volatile sulphur compound, but the spirit was quite free from sulphur. The remaining fluid was then acidified with nitric acid, which caused brisk effervescence and a strong smell of hydrocyanic acid. Nitrate of silver was added as long as it continued to produce a precipitate; the precipitate, dried and heated, gave off cyanogen, which burnt with its characteristic flame. The clear filtrate, slowly evaporated to dryness, left a pale yellow crystalline mass, which did not change colour by several days' exposure to light. Part of this, burnt in a porcelain crucible, gave off nitrous fumes, and left a considerable residue blackened by oxide of silver. Water was added to this residue, and the oxide of silver filtered off, and an abundant precipitate of sulphate of baryta obtained, with a salt of baryta. The remainder of the yellow salt was redissolved in water, with a view to separate a granular portion which was mixed with the more perfectly crystalline salt, but an accident unfortunately spoilt the remainder, and rendered any further progress impossible.

Sulphocyanide of ammonium may be obtained in considerable quantity from an alcoholic solution of foul clay. Upon one occasion I obtained nearly an ounce, in a fair state of purity, from less than a quart bottle of foul clay; and so tenaciously does clay retain this compound, that from some clay which had been exposed to the full action of the weather in a field for two years, I obtained a considerable coloration with perchloride of iron. Sulphocyanide of ammonium may be obtained from gas which has been purified by oxide of iron, by passing the gas through spirit of wine and evaporating.

When common yellow brick-clay is used in the purification of coal-gas, the solutions from it always contain salts of iron, but they never become of a blood-red colour until a mineral acid is added. When, however, the solutions are evaporated, and the deliquescent residue is exposed to the air, most, and sometimes all of the iron is peroxidized and yields the well-known reaction.

The nitrogen in tar may be shown from the spirit-solution off foul clay. The spirit, evaporated to dryness and allowed to stand, deposits tar and a mixture of deliquescent crystalline salts. They were allowed to deliquesce, the fluid was removed, and the residual tar well washed with water. Subsequently it was dissolved in hot spirit, precipitated by water, and well washed. When nothing more was removed by washing, the tar was heated, and evolved sulphide of hydrogen and ammonia. Contrary to every other compound in gas with which I have experimented, this tar gave off sulphide of hydrogen before ammonia. In other instances I have found the nitrogen compound evolved at a lower temperature than the sulphur one.

Mineral matter derived from the clay is found in all solutions; but as my object in this paper is to speak only of substances in gas, I purposely omit those united with them derived from the clay. For the same reason I make no mention of the value of the foul clay as a manure.

Sulphur compounds in gas purified so as not to affect basic acetate of lead, and their removal.

A recent Royal Commission on lighting picture galleries, has stated the large quantity of sulphur found in some London gas, and has intimated a doubt about the

possibility of its removal. Dr. Letheby concludes, from seven years' examination of gas in London, that though quite free from sulphide of hydrogen, it contains, on an average, 200 grains of sulphur in 1000 cubic feet; and Dr. Frankland, in the new edition of "Ure's Dictionary of Arts," part iv., pp. 730, 731, writes, "It is probable that volatile organic compounds of sulphur are produced by the action of this element with carbon and hydrogen simultaneously, although we have as yet no positive evidence of their presence in illuminating gas. . . When once generated with coal-gas, all attempts to remove these constituents have hitherto proved ineffectual, and there seems little ground for hope that any practicable process will be devised for their abstraction." I have now the honour to submit evidence of the existence of these sulphurized compounds, and also a practical process for their removal. My attention was specially drawn to this subject by a conversation with the manager of a London gas-works. He informed me that he not unfrequently filled his gas-holders with gas which would not affect acetate of lead, and that after the gas had been stored a few hours, it became so foul as to blacken lead-paper the instant it was applied. He sought an explanation of this phenomenon; and as the water of his gas-holder tanks was clean, and there were no accidental sources of sulphide of hydrogen, I concluded that an organic compound containing sulphur and hydrogen had been broken up, and that the sulphide of hydrogen was thus produced. I learnt also, by other observations, that gas which went to the gas-holders free from ammonia, sometimes became ammoniacal if kept, and joining this fact with the former one, inferred that the compound which thus broke up contained nitrogen as well as sulphur and hydrogen. Subsequently I observed that the saturated clay taken from the purifiers of gas-works, contained a quantity of foul naphthalin. This led me to procure a quantity of (so called) naphthalin which had been taken from the mains of a London gas-works, and which therefore must have been deposited by purified gas. Some portions of this naphthalin were white, but others were slightly darkened by the presence of carbonaceous matter, and the whole was in *fine powder*, aggregated together by the process of deposition. The tendency to form exceedingly small crystals seems a constant characteristic of naphthalin which has been deposited in gas-pipes, for by no amount of care and trouble have I been able to obtain it in large crystals, though the solutions from which it has crystallized have been months in evaporating. With naphthalin from tar, on the contrary, I have obtained, from an etherial solution, crystals an eighth of an inch thick, nearly half an inch broad, and more than half an inch in length. The supposed naphthalin from gas-pipes dissolves wholly in ether and hot alcohol, and crystallizes from the spirit on cooling as pure naphthalin does. The solutions are neutral to test-papers. Boiled with an alcoholic solution of potash it evolves no ammonia, and with hydrochloric acid no sulphide of hydrogen. Heated alone, it evolves first ammonia, and then sulphide of ammonium, mixed, I think, with a trace of bisulphide of carbon, and then distils. Several samples began to give off their ammonia at 388° Fahr., and sulphide of hydrogen at 422° Fahr., leading to the hope that here was a compound of definite composition which would admit of correct analysis and perhaps of formulation; but some more of the naphthalin, produced, like the other, from Newcastle coal, but at another gas-works, possessed such different physical properties as to convince me that very much more must be known of this substance before any reliable analyses can be published. The latter sample gave a neutral solution in spirit, like the other, but of a considerably browner colour. When heated alone it gave off ammonia with ebullition at 218° Fahr., and then became tranquil. When the temperature reached 375° Fahr., it began to evolve sulphide of hydrogen, which continued to increase in quantity up to 390° Fahr., when it nearly ceased, and quite ceased at 410° Fahr. The proportion of tar in this sample was much greater than I have seen it in any other. Subsequently I obtained some more naphthalin which had been deposited in the pipes of another gas-works, and this, like the former, contained both nitrogen and sulphur, which were evolved upon distillation as sulphide of hydrogen and ammonia.

Having thus obtained one sulphurized hydrocarbon, and determined the temperature at which its sulphur and nitrogen could be obtained as easily removable compounds, I was prepared to advance towards a better purification of gas with great probability of success. Another well-confirmed observation helped to guide me.

Gas freed from every trace of sulphide of hydrogen always blackens lead-paper strongly when passed through clay; and if it be subsequently passed through lime, it affects turmeric, though quite free from ammonia when taken for experiment. This process may be repeated through a series of ten or twelve purifiers containing clay and lime placed alternately, the test-papers being less affected at each purifier, until at length they are not discoloured at all. This experiment has been made upon gas produced in various parts of England and Scotland from many kinds of coal, and I think the number of instances sufficient to justify the conclusion that *all* gas, as sold, contains the compound from which clay liberates sulphide of hydrogen. I have not yet been able to separate the compound upon which clay thus acts. I have, however, ascertained that the clay which has liberated sulphide of hydrogen from gas which did not affect test-papers when taken for experiment contains tar, which may be dissolved out by alcohol, and may be obtained alone by evaporating the solvent.

Although collateral matter has been carefully excluded from this paper, I cannot refrain from remarking that the property of clay here mentioned is in fact the announcement of a new property of soils, and one which will help to account for the formation of many natural metallic sulphides. I hope soon to have some investigation of this subject ready for publication.

To ascertain whether this property of breaking up a sulphurized compound in purified gas and removing tar was possessed by clay alone, or shared by other substances used in purification, some purified gas was passed through a considerable chemical excess of all the substances employed in purification, viz. lime, precipitated peroxide of iron, sulphate of iron, chloride of calcium, and dilute sulphuric acid, all but the lime being mixed with moist sawdust. Upon passing the gas next through a purifier filled with clay, it darkened lead-paper, and affected turmeric when it had passed a subsequent purifier filled with lime. This proves the power of clay to break up one or more sulphurized compounds which no other substance used in purification effects; and if this sulphur were not liberated from the impure naphthalin compound already mentioned, it seemed certain that gas which had been previously purified by clay might be much improved, if not rendered pure, by a removal of the sulphur of the naphthalin. There is strong experimental evidence that the compound from which clay liberates sulphide of hydrogen is not the sulphurized naphthalin one; for if hydrogen be passed through a vessel containing this substance, then through clay, and subsequently over lead-paper, no trace of sulphide of hydrogen is found, though the gas passing smells strongly of impure naphthalin. This gas and vapour burn with a lightless flame. Subsequently some naphthalin was heated to ebullition, and a current of hydrogen sent through it and then burnt. The flame was lightless as before. I mention this fact to remove the popular error that naphthalin, as it exists in coal-gas, is a good illuminant. Even Dr. Frankland thus regards it; and both in Clegg's book on coal-gas, and in the new edition of Ure's Dictionary, it is stated that the hydrocarbons in gas are valuable in proportion to the carbon they contain, and that naphthalin is the most valuable, as containing the largest proportion of carbon. The above-mentioned experiments evince the contrary. On another occasion I determined the illuminating power of some gas, and then, without alteration of the quantity passing, sent the gas through a U-tube containing naphthalin from the London gas-mains. The character of the flame was changed from white to red, but the photometer indicated no difference in the light given. Two other persons conversant with photometry were present at this experiment and agreed in the result, though up to that time they had held the prevailing opinion as to the value of naphthalin in gas without testing the statements made upon the subject.

Another sulphur compound is said always to be present in coal-gas and to be irremovable, and which, like those I have hitherto spoken of, does not affect lead-paper, viz. bisulphide of carbon. To ascertain the presence of bisulphide of carbon, I pass gas through strong spirit of wine (methylated spirit answers perfectly) kept at about 160° Fahr. The gas and vapours pass out of the flask which contains the spirit up a long tube into an inverted flask, so that all which is condensed may run back into the spirit. It then passes into another flask for additional condensation, and thence forward to a gas-holder or burner. Bisulphide of carbon dissolved

in spirit becomes precipitated as a white cloud which settles to the bottom of the vessel, when the spirit is copiously diluted with water. The white cloudy precipitate escapes slowly by single bubbles through the diluted spirit, and at length leaves a solution perfectly clear. The spirit through which gas has passed, and from which it has abstracted bisulphide of carbon, acts in precisely the same manner upon dilution, and no one who has seen the reaction once or twice can possibly mistake it. The study of other compounds led me to conclude that if this substance exist *as such*, and not merely *by its elements*, in gas, it could be removed almost as easily as the naphthalin compound could be purified, and that the same process could be made available to remove the sulphur of both. I thought that under certain conditions the affinity of hydrogen for sulphur would exceed that of carbon for sulphur, and therefore that I might obtain the sulphur of bisulphide of carbon as a sulphide of hydrogen, about the removal of which there is no difficulty. Experiment confirms the reasoning. When hydrogen mixed with vapour of bisulphide of carbon is passed through a tube filled with slaked lime or clay which has been dried at 400° or 500° Fahr., and is kept between 400° and 600° Fahr. during the passage of the gas and vapour, not a trace of bisulphide of carbon passes from the tube, but sulphide of hydrogen does pass. The lime is darkened by a deposit of carbon, and a sublimate of sulphur is found in the exit-tube. A considerable excess of hydrogen should be used, or else a portion of the bisulphide of carbon vapour is carried over by the current and escapes decomposition. That this reaction is not the result of heat merely, but is a truly chemical one which the base under the influence of heat effects, and the remarkable fact that slaked lime when heated forms, but does not unite with, sulphide of hydrogen, receive illustration from the following experiments:—

Hydrogen and vapour of sulphide of carbon were passed through—1st, cold slaked lime; 2nd, cold clay; 3rd, hot oxide of iron used at a gas-works in purification; 4th, hot broken bricks; 5th, hot broken glass, without in any instance producing sulphide of hydrogen. On the contrary, when passed through (1) hot lime and (2) hot clay, sulphide of hydrogen was formed and passed over immediately, and continued to pass as long as the current was kept up. The lime, when cooled out of contact with the air, gave no sulphide of hydrogen upon being supersaturated with dilute sulphuric acid, but clay when thus treated gave off much.

The hydrogen used was in all cases passed through lime and over lead-paper, to secure its being free from sulphide before use. On one occasion, when the clay had been imperfectly dried before heating, I observed much sulphurous acid instead of sulphide of hydrogen. I therefore passed hydrogen, bisulphide of carbon vapour, and steam over hot clay which had been properly dried. At first sulphide of hydrogen passed over alone, then mixed with sulphurous acid, which at length passed alone. Subsequently sulphide of hydrogen passed, and at length sulphurous acid ceased. As the one gas increased the other diminished, and throughout the experiment sulphide of carbon vapour passed undecomposed. It is shown by this experiment that hot clay in the presence of more water than forms a hydrate acts very differently from the same clay when dry, and the whole subject deserves a full investigation.

Action of sulphide of hydrogen upon clay and lime, cold and hot.

Well-washed sulphide of hydrogen passed into cold slaked lime (obtained from Buxton) in a tube, colours the lime green as soon as it comes into contact with it, and the progress of the gas along the tube corresponds with the coloration. Lead-paper is not affected until the lime becomes coloured close up to the exit.

The same gas, passed into a tube containing slaked lime kept about 600° Fah. at the middle, but cool at both ends, acts differently. The cool lime at the inlet end becomes coloured; the hot lime in the middle remains white; and the cool lime at the exit end becomes coloured, and lead-paper is stained as soon as these two cool portions are saturated, while the middle portion remains unchanged in colour.

The same gas, passed into a tube containing hot lime only, causes no discoloration, but instantly blackens lead-paper placed at the exit end; and upon being conducted into a tube of cold lime, colours it as if it had just passed from the vessel in which it is produced.

The same gas was passed into a tube containing lime which had been thoroughly

dried at 600° Fahr., and cooled out of contact with the air. No discoloration of the lime took place, but the gas passed unaffected by the lime, and blackened lead-paper. Water added to the lime gives it the power of decomposing the gas as if it had not been heated. The presence of more water than is necessary to form hydrate of lime (Ca O, HO), is thus shown to be required for the decomposition of sulphide of hydrogen by slaked lime.

Sulphide of hydrogen passed into a tube of cold clay is taken up in considerable quantity, and the clay becomes black from the formation of sulphide of iron. The blackening begins at the inlet end, and progresses with the passage of the gas towards the exit end of the tube.

The same gas, passed into clay, heated to 500° or 600° Fahr., gives the same reactions; but when the clay has been heated and well dried, and cooled in the closed tube, it takes up a very small quantity of the gas.

Coal-gas, quite free from sulphide of hydrogen, when passed through hot lime, blackens lead-paper, showing that masked and hitherto irremovable compounds have been so altered as to be easily removable. The lime does not take up sulphide of hydrogen, but becomes gradually, yet very slowly, darkened by the deposition of tar and carbon from vapour of bisulphide of carbon. The reaction with previously dried slaked lime commences at 108° Fahr., and continues through the whole range of temperature up to redness. At a red heat the sulphur of the bisulphuret of carbon and other sulphur compounds unites with the lime and forms sulphide of calcium. Practically very high temperatures are useless, as the hydrocarbons of gas begin to be decomposed about the melting-point of lead, and to deposit their carbon upon the hot lime. Fortunately injurious temperatures are not required. I have frequently freed gas from every trace of sulphur, so that upon combustion no sulphurous acid was generated, by employing lime so heated as not to deposit any carbon, and removing the sulphuretted hydrogen evolved in the hot tube by ordinary hydrate of lime.

The same gas passed through hot clay gradually darkens the clay by forming sulphide of iron, and, when the blackness has reached the end of the tube containing the clay, lead-paper is blackened by the passing gas. The clay treated with an acid evolves sulphide of hydrogen. Carbonic acid is evolved in both cases. It is thus proved that bisulphide of carbon, in the presence of hydrogen passing over hot hydrate of lime, is decomposed, and that its sulphur becomes united to hydrogen. Coal-gas always contains a considerable quantity of hydrogen, so that, if it contain vapour of bisulphide of carbon, the process I have the honour to describe will effect its removal. The same process will break up the impure naphthalin compound and convert its sulphur into sulphide of hydrogen; and the employment of clay in the ordinary purifiers, before the gas passes through the hot ones, will so arrange the elements of certain other sulphur compounds as to enable the manufacturer to remove their sulphur as sulphide of hydrogen. Sulphocyanide of ammonium is decomposed by the heated lime, and its sulphur is liberated as sulphide of hydrogen. The only requisite for complete success was that no injury should be done to the light-giving materials of gas while removing the impurities. I have passed the principal illuminating constituents of coal-gas through the hot lime and clay, and find that they are not injured. The temperature which suffices for purification is not high enough for injury. The photometer shows that coal-gas is not injured.

The quantity of tar in gas as supplied to consumers, and the evil of its presence as a source of sulphur, are not considered as, I think, they deserve to be. It is exceedingly rare to find gas free from tar, and I never yet met with tar which did not contain both nitrogen and sulphur. Part of this tar is combined with ammonia in some manner, and may be obtained by passing gas through a bottle containing pebbles moistened with hydrochloric acid. Part is united to naphthalin, as I have already mentioned; part is united to benzole vapour, and part to other hydrocarbon vapours, such as paraffin, if two instances within my own knowledge be sufficient to justify a statement in reference to gas in general. In one instance I passed gas through a metal vessel filled with a number of wire-gauze diaphragms and kept below 32° Fahr. Some cakes of solid paraffin were found floating upon the water which had been placed in the vessel before commencing the experiment, and a mixture of tarry oils which had deposited the paraffin. In another instance,

an old gas-holder was about to be replaced by a new one, and on the water of the tank in which the old gas-holder had worked, there was found upwards of a thousand gallons of a dark-coloured fluid. All but two carboys was sold to a tar distiller. These two carboys were left exposed to the air without corks for some time, and when the manager of the gas-works went to get me some of the fluid for examination, he found that the whole contents had evaporated. I had previously, however, obtained about half an ounce of the mixture. It contained paraffin, naphthalin, and the oils which accompany paraffin. Nearly a fifth of its weight of solid pitch was obtained by distilling off the hydrocarbons. A quantity of sulphide of hydrogen and ammonia were evolved during the distillation, and some of the most stinking compounds I ever met with produced from coal. From these two instances it is clear that some, or perhaps all, of the volatile hydrocarbons in gas possess the power of upholding tar with them in their vapours; and it is proved that this tar is no inconsiderable source of the sulphurous acid produced by the combustion of gas as at present purified. I have obtained tar containing sulphur from every specimen of commercial benzole I have examined; and as this will evaporate at common temperatures without leaving a residue, we are justified in the presumption that tar thus united to benzole exists in gas.

The best method of showing the tar in gas is to pass it through or over well-purified coal-oil, and subsequently through a good condensing arrangement. I have known colourless coal-oil become of a dark mahogany colour, and have separated sulphuretted hydrogen, ammonia, and solid pitch by distillation.—*Proceedings of the Royal Society.*

ON THE ACTION OF GASES AND VAPOURS ON RADIANT HEAT.

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(*Substance of a Lecture delivered at the Royal Institution, Jan.* 18, 1861.)

The discourse commenced by a reference to the researches of Leslie, Forbes, and Knoblauch; but more especially to the admirable investigations of Melloni on Radiant Heat. These eminent men had left the gaseous form of matter practically untouched, and to extend our knowledge into this wide region was the object of the investigation on which the present discourse was founded.

The apparatus made use of, and which was applied in the experiments of the evening, consists of the following parts:—

1. A copper cube C, containing water kept constantly boiling, and one of whose faces, coated with lamp-black, forms the source of radiant heat.

2. A brass tube, 2.4 inches in diameter, which is divided into two portions, α and β.

α. The portion of the tube intended to receive the gases and vapours; it is stopped air-tight at its two ends by plates of rock-salt, and is attached to a good air-pump by which it can be exhausted at pleasure. The length is 4 feet.

β. An air-tight chamber between the tube α and the cube C. It is kept constantly exhausted, and the calorific rays therefore pass from the radiating plate through a vacuum into the tube, thus retaining the quality which belonged to them at the moment of emission.

To prevent the transmission of heat by conduction from the cube C to the tube α, the chamber β is partly embraced by an annular space, in which cold water continually circulates.

3. A thermo-electric pile furnished with two conical reflectors, and connected with an excellent galvanometer. One of the faces of the pile receives the rays which have passed through the tube α.

4. A second copper cube C′, also filled with boiling water, and whose rays fall upon the second face of the thermo-electric pile. The two cubes C and C′, thus radiating upon the opposite faces of the pile, tend, of course, to neutralize each other.

Between the cube C′ and the adjacent face of the pile a screen S is introduced, being attached to an apparatus of Ruhmkorff's, capable of extremely fine motion; by the partial advance or withdrawal of this screen the two sources of heat can be caused to neutralize each other perfectly.

The tube α and the chamber β, being both exhausted, the needle of the galvanometer is brought exactly to zero by means of the screen S. The gas or vapour to be experimented with is now admitted into the tube α, and if it possess any sensible absorbing power, it will destroy the previously existing equilibrium. The consequent deflection of the galvanometer, properly reduced, is the measure of the absorption. In this way the action of eight gases and thirteen vapours have been examined, and also the action of atmospheric air.

Oxygen, hydrogen, nitrogen, and atmospheric air, respectively absorb about 0.3 per cent. of the calorific rays; this is the feeblest action which has been observed.

The most energetic action is that of olefiant gas, which at the tension of one atmospheric absorbs 81 per cent. of the calorific rays. Between those extremes stand carbonic oxide, carbonic acid, nitrous oxide, and sulphuretted hydrogen.

Below a certain tension, which varies for different gases, the amount of heat absorbed is exactly proportional to the density of the gas. Above this tension, the rays on which the principal absorptive energy is exerted, become gradually exhausted, so that every augmentation of density produces a diminished effect.

In the case of olefiant gas, for example, where a unit measure $\frac{1}{50}$th of a cubic inch in capacity was made use of; for a series of fifteen such measures, the absorption was exactly proportional to the quantity of gas; subsequently, the ratios of the successive absorptions approached gradually to equality. The absorption produced by a single measure of olefiant gas of the above volume, moved the index of the galvanometer through an angle of 2.2 degrees; the tension of the gas being only $\frac{1}{11000}$th of an atmosphere.

In the case of vapours, the most energetic is that of sulphuric ether; the least energetic is that of sulphide of carbon. Comparing small volumes and equal tensions, the absorptive energy of sulphuric ether vapour is ten times that of olefiant gas, and ten thousand times that of oxygen, hydrogen, nitrogen, or atmospheric air.

On a fair November day the aqueous vapour in the atmosphere produced fifteen times the absorption of the true air itself. It is on rays emanating from a source of comparatively low temperature that this great absorptive energy is exerted; hence the aqueous vapour of the atmosphere must act powerfully in intercepting terrestrial radiation; its changes in quantity would produce corresponding changes of climate; subsequent researches must decide whether this *vera causa* is competent to account for the climatal changes which geologic researches reveal.

Oxygen obtained from the electrolysis of water exerted four times the absorptive energy of the same substance when caused to pass through iodide of potassium; the greater action being due to the presence of ozone.

The radiative power of gases was examined by causing them to pass over a heated sphere of metal, and ascend in a column in front of the thermo-electric pile; various precautions were taken to secure accuracy in the results. It was found that the order of radiation was exactly that of absorption; that any atom or molecule which is capable of accepting motion from agitated ether, is capable in precisely the same degree of imparting motion to still ether. Films of gas on surfaces of polished metal were found to act like coats of varnish.

The speaker also investigates the physical connexion of radiation, absorption, and conduction. In the foregoing experiments *free* atoms and molecules were dealt with, and upon them individually was fixed the responsibility of the effects observed. These effects are thus detached from considerations of cohesion and aggregation which suggest themselves in the case of liquids and solids.

The reciprocity of absorption and radiation is a simple mechanical consequence of the theory of an ether.

But why is one molecule competent to stop or generate a calorific flux so much more powerfully than another? The experiments prompt the following reply:—The elementary gases which have been examined all exhibit extremely feeble powers both of absorption and radiation, in comparison with the compound ones. In the former case we have oscillating atoms, in the latter oscillating systems of atoms. Uniting the atomic theory with the conception of an ether, it follows that the *compound* molecule which furnishes *points d'appui* to the ether must be capable of accepting and generating motion in a far greater degree than the single atom, which we may figure to our minds as an oscillating sphere. Thus oxygen and hydrogen,

which, taken separately, or united mechanically, produce a scarcely sensible effect, when united chemically to form oscillating systems as in aqueous vapour, produce a powerful effect. Thus also, nitrogen and hydrogen, which, when separate or mixed, produce but little action, when combined to form ammonia produce a great action. So also nitrogen and oxygen, which, when mixed as in air, are feeble absorbers and radiators, when united to oscillating systems, as in nitrous oxide, are very powerful in both capacities. Comparing small volumes and equal tensions, the action of nitrous oxide is 250 times that of air; a fact which perhaps furnishes a stronger presumption than any previously existing, that air is a *mixture*, and not a compound. Carbonic oxide is about 100 times as powerful as its constituent oxygen; carbonic acid is 150 times as powerful, while olefiant gas, as already remarked, is 1000 times as powerful as its constituent hydrogen. In the case of the hydro-carbon vapours, were the atomic groups attain a higher degree of complexity, the action is even greater than that of olefiant gas.

The speaker also refers to the experiments and observations of Niepce, Angstrom, and Foucault; but more especially to the admirable researches of Kirchhoff and Bunsen, as regards the influence of the period of oscillation on the rate of absorption. He points out how the grouping of atoms to systems in a resisting medium must tend to make their periods of oscillation longer, and thus bring them into isochronism with the periods of the obscure radiations made use of in the experiments.

With regard to conduction, the speaker would illustrate his views by reference to two substances—rock-salt and alum. He was once surprised to observe the great length of time required by a heated mass of rock-salt to cool; but this was explained by the experiments of Mr. Balfour Stewart, who shows that rock-salt is an exceedingly feeble radiator. The meaning of this is, that the molecules of the salt glide through the ether with small loss of *vis viva*. But the ease of motion which they are thus proved to enjoy must facilitate their mutual collision. The motion of the molecules, instead of being expended on the ether between them, and then communicated in part to the ether external to the mass, is transferred freely from particle to particle; or in other words, is freely conducted. This *à priori* conclusion is completely verified by the author's experiments, which prove rock-salt to be an excellent conductor. It is quite the reverse with alum. Mr. Balfour Stewart's experiments prove it to be an excellent radiator, and the author's experiments show it to be an extremely bad conductor. Thus it imparts with ease its motion to the ether, and for this very reason finds difficulty in transferring it from particle to particle; its molecules are in fact so constituted, that when one of them approaches its neighbour, a swell is produced in the intervening ether, this motion is immediately communicated to the ether outside, and is thus lost for the purposes of conduction. The lateral waste prevents the motion from penetrating the alum to any great extent, and hence it is pronounced a bad conductor. These considerations seem to reduce the phenomena of absorption, radiation, and conduction to the simplest mechanical principles.

ON THE ELECTROLYTIC TEST FOR ARSENIC, AND ON THE PRESENCE OF THAT METAL IN CERTAIN REAGENTS.

BY CHARLES L. BLOXAM.

In a former communication upon this subject* which I had the honour of presenting to the Society, it was shown that when a solution containing arsenious acid is mixed with diluted sulphuric acid and subjected to the action of the voltaic current, arseniuretted hydrogen is evolved at the negative terminal, and that in this way very minute quantities of arsenious acid can be detected with great certainty, even in the presence of large quantities of organic matter, and without adding any material to the liquid which would interfere with its examination by other analytical processes. It was also stated that arsenic acid did not respond to this test, and that the presence of mercury in the liquid interfered very materially with the detection of the arsenic.

It is the object of this paper to show how arsenic acid may be brought within reach of this test, how the interference of mercury may be prevented, and how all chance of error due to the evolution of antimoniuretted hydrogen may be avoided.

* Noticed in *Pharmaceutical Journal*, 2nd series, vol. I., page 376.

The form of apparatus recommended in the previous notice admitted of some obvious improvements. A tube-funnel has been added, to permit the introduction of the liquid to be tested, and the platinum wires communicating with the battery have been replaced by broad strips of platinum foil.

If arsenious acid be converted into arsenic acid by boiling with hydrochloric acid and chlorate of potassa, and the solution be poured into the diluted sulphuric acid during the passage of the current, no arseniuretted hydrogen is evolved; but if a few drops of solution of sulphurous acid or bisulphite of soda be poured down the funnel-tube, a greenish yellow iridescent crust of tersulphide of arsenic is almost immediately deposited at a little distance beyond the heated portion of the tube, and is followed, in most cases, by the usual mirror of metallic arsenic.

Since arsenic acid is reduced with great difficulty by sulphurous acid at the ordinary temperature, it appeared probable that the effect was really due to the hydrosulphuric acid formed by the action of the nascent hydrogen upon the sulphurous acid, and accordingly it was found that the introduction of a few drops of solution of hydrosulphuric acid into the electrolytic cell also caused the evolution of arseniuretted hydrogen.

If an excess of hydrosulphuric acid be employed, a deposit of sulphur is formed in the tube, nearer to the orifice than the deposit of sulphide of arsenic, from which it may be very easily distinguished by its much lighter colour, and by its insolubility in a warm solution of sesquicarbonate of ammonia, which readily dissolves the sulphide of arsenic.

Three experiments may be especially referred to in evidence of the certainty attending this process.

0.01 grn. of arsenious acid was boiled with hydrochloric acid and chlorate of potassa, and introduced into the electrolytic apparatus, and the reduction-tube through which the hydrogen escaped was heated to redness for 30 minutes without any appearance of deposit; but, on adding 5 grn. measures of a solution of bisulphite of soda, a yellow crust of tersulphide of arsenic made its appearance in 5 minutes, and was followed by a distinct deposit of metallic arsenic, identified by its volatility and its solubility in chloride of lime.

In a second similar experiment, 10 grn. measures of a saturated solution of hydrosulphuric acid were poured down the funnel-tube, instead of the bisulphite of soda. The crust of sulphide appeared within 10 minutes, and that of metallic arsenic within 15 minutes.

A third experiment was made with only 0·001 grn. of arsenious acid which had been boiled with hydrochloric acid and chlorate of potassa; within 13 minutes after the addition of 10 grn. measures of hydrosulphuric acid, the yellow sulphide of arsenic appeared in the tube.

It was found that however large a proportion of hydrosulphuric acid was poured into the decomposing cell, the arsenic was still evolved, the metal combining with the nascent hydrogen in preference to the sulphur. It appeared probable, however, that the addition of hydrosulphuric acid would at once precipitate any antimony or mercury present in the liquid under examination, and would prevent their interference with the detection of the arsenic.

One grain of tartar-emetic (0.36 grn. Sb) dissolved in water, was slightly acidulated with sulphuric acid, mixed with an excess of hydrosulphuric acid, and poured, without filtering, into the decomposing cell in which the diluted sulphuric acid was undergoing electrolysis; the evolution-tube was maintained at a red heat for 38 minutes without any deposit in the tube except a thin film of white sulphur.

Another grain of tartar-emetic was then mixed with 0.01 grn. of arsenious acid, which had been boiled with hydrochloric acid and chlorate of potassa, and the mixture was treated with an excess of hydrosulphuric acid, and poured into the same decomposing cell without interrupting the experiment. In 5 minutes, yellow rings of tersulphide of arsenic made their appearance in the capillary reduction-tube; in less than 15 minutes, a distinct crust had formed, presenting exactly the same appearance as if no antimony whatever had been present. No deposit had been formed upon the negative plate.

In the next trial, only 0.001 grn of arsenious acid was mixed with 1 grn. of tartar-emetic; the solution was boiled with hydrochloric acid and chlorate of

potassa, diluted to one fluid ounce with water, saturated with hydrosulphuric acid gas, and poured, with the suspended precipitate, into the decomposing cell. Within 15 minutes, a distinct deposit of metallic arsenic was obtained, which dissolved immediately in solution of chloride of lime.

When 1 grn. of tartar-emetic and 0.01 grn. of arsenious acid were mixed with considerable quantities of bread, milk, and beer, and the brown treacly liquid obtained by boiling with hydrochloric acid and chlorate of potassa, and subsequent evaporation, was mixed with excess of hydrosulphuric acid and poured into the decomposing cell, deposits of metallic arsenic and of the tersulphide were almost immediately formed in the tube. On collecting the dark precipitate after the operation, it was easily identified as sulphide of antimony.

In a second experiment of this description, one-fourth of the brown fluid (containing 0.09 grn. Sb and 0.0025 grn. AsO_3) was introduced into the decomposing cell without adding hydrosulphuric acid, when a very distinct mirror of antimony was, of course, formed in the reduction-tube, and a deposit of that metal was obtained on the negative plate. The reduction-tube was then changed, and hydrosulphuric acid added, when deposits of arsenic and its sulphide, free from antimony, were formed in the tube.

To prove that, with this modification of the test, the presence of mercury no longer prevented the detection of arsenic, experiments precisely similar to those above described were made, respectively, upon mixtures of 1 grn. corrosive sublimate with 0.01 grn. arsenious acid, and 0.25 grn. corrosive sublimate with 0.0025 grn. arsenious acid, mixed with white of egg, bread, milk, and beer, when no difficulty whatever was found in the detection of the arsenic.

The solution containing chloride of mercury and arsenic acid was electrolytized for half an hour without the slightest appearance of arsenical deposit in the heated tube, the mercury being deposited abundantly upon the negative plate; but on the addition of solution of hydrosulphuric acid, a crust of metallic arsenic was soon obtained.*

In order to ascertain whether the occurrence of putrefaction in an organic mixture containing arsenious acid would interfere with its detection by the electrolytic test, an experiment was made with 0.001 grn. of arsenious acid mixed with meat, white of egg, beer, bread, and milk, and allowed to putrefy for nearly twelve months. No difficulty was experienced in detecting the arsenic.

I am very desirous of convincing myself that reliance may, in all cases, be placed on this process for the detection of arsenic, by operating upon organic matters *exactly similar* in their nature and quantity to those often submitted to the chemist in judicial inquiries, but have hitherto been unable to do this, in consequence of the difficulty of procuring hydrochloric acid so pure that, when examined in the large quantity required for the disintegration of considerable masses of viscera, it did not afford any indication of the presence of arsenic. Believing that I possessed a quantity of sulphuric acid perfectly free from arsenic, I employed it for the preparation of hydrochloric acid; but even this sample was not found to be absolutely free from the impurity, and on resorting to the sulphuric acid, the examination of a large quantity at once proved the presence of a very minute proportion of arsenic, which was more easily traced in the hydrochloric acid, since the latter could be employed without inconvenience in larger quantity, both in the electrolytic and in Marsh's test. The production of sulphuric acid absolutely free from arsenic is now engaging my attention.

* It will be evident that this method of converting the arsenic into arsenic acid and precipitating the antimony and other metals by hydrosulphuric acid, in the *cold*, may be employed with advantage in Marsh's test; the solution containing the arsenic acid must be filtered, however, before introduction into the evolution bottle, as the suspended sulphide of antimony was found to be immediately decomposed in contact with zinc and sulphuric acid. In a mixture containing a grain of tartar-emetic and one-hundredth of a grain of arsenious acid, the latter was detected as easily as if no antimony had been present, by boiling with hydrochloric acid and chlorate of potassa, precipitating the cold solution with excess of hydrosulphuric acid, filtering, and pouring into Marsh's apparatus. In Marsh's test, the use of electrolytized zinc was found to be attended with advantage in minute investigation, on account of the very slow and steady evolution of gas.

It has also been incidentally noticed in the course of these experiments, that various samples of solution of potassa and of the solid hydrate contained very notable quantities of arsenic, attributable probably to their having been prepared from nitre by the action of (arsenical) copper at a high temperature.

A more important point for the consideration of the analytical chemist is the occurrence of arsenic in the hydrosulphuric acid, prepared in the usual manner from sulphide of iron and diluted sulphuric acid. On passing the gas for 10 or 15 minutes through a reduction-tube heated to redness, a distinct crust of sulphide of arsenic was formed nearer to the heated portion than the deposit of sulphur. That the crust really consisted of sulphide of arsenic was proved by its solubility in carbonate of ammonia, and by its furnishing metallic arsenic when fused with carbonate of soda and cyanide of potassium in a current of carbonic acid. This experiment was repeated, with the same results, upon different samples of sulphide of iron and sulphuric acid. That the arsenic was due to the sulphide of iron, was ascertained by employing only so much of the purest sulphuric acid as gave no indication of arsenic in Marsh's process. Water saturated with the gas, when examined by Marsh's and the electrolytic test, was not found to contain arsenic.

No arsenic was detected in the washed hydrosulphuric acid gas prepared from native sulphide of antimony and hydrochloric acid.—*The Quarterly Journal of the Chemical Society.*

ON THE MYRONATE OF POTASH FROM BLACK MUSTARD.

BY MM. H. LUDWIG AND W. G. LANGE.

We know, from the researches of M. Bussy, that black mustard does not contain the essential oil ready formed, but that it is produced, in the presence of water, by the action of the myrosine on a particular salt—the myronate of potash. The results of M. Bussy have been confirmed by other authors, who have added several facts relating to the composition and decompositions of the myronate of potash.

To prepare this salt in the state of crystals we commence by macerating the black mustard in two successive portions of rectified spirit and then in two portions of cold water. The myronate is contained in the aqueous liquors. These are evaporated to a syrupy consistence, and the residue heated with weak spirit. The liquid becomes turbid on cooling. It is filtered and concentrated, when a deposit of crystals of myronate of potash takes place. These may be purified by a second crystallization. Five hundred grammes of black mustard have given by this process one gramme of colourless crystallized myronate of potash ; 1500 grammes have given 7.5 grammes.

One hundred parts of myronate of potash contain :—

Carbon	29.98
Hydrogen	4.91
Nitrogen	3.97
Sulphur	14.93
Oxygen	34.92
Potash	11.29
	100.00

These numbers correspond to the formula—

$$KO, C_{20}H_{19}NS_4O_{18}. (?)$$

When we treat the myronate of potash with recently-prepared myrosine (aqueous extract of white mustard), a strong odour of essential oil of mustard is manifested. The reaction does not give rise to the disengagement of gas. When it has terminated, if we submit the aqueous liquid to distillation, the essential oil of mustard passes over with the water, and a milky acid liquor remains in the retort. This liquid holds sulphur in suspension. It contains some sulphate of potash in solution ; but the sulphate equals only a fourth of the sulphur present in the myronate. Evaporated, the liquid in question leaves a residue from which weak spirit extracts some fermentable sugar. When this is converted into alcohol, if we boil the fermented liquid with a few drops of sulphuric acid, neutralize with chalk, and add yeast, a fresh fermentation takes place; proving that a new portion of sugar was formed

under the influence of the sulphuric acid. The total quantity of sugar (C_{12} H_{12} O_{12}) formed amounts to 44.99 per cent. of the weight of the myronate of potash employed. The myronate, when submitted to the action of yeast, yields no carbonic acid.

In the aqueous solution of myronate of potash, nitrate of silver forms, after some time, a white precipitate. On boiling, this is dissolved, but a black precipitate of sulphide of silver soon forms, and a strong odour of oil of mustard is at the same time manifested. The oil is formed then under these conditions, without the intervention of the myrosine.—*Annalen der Chimie*, January, 1861.

A NEW SALT OF IRON AND QUININE.

(*Communicated by Dr. Fergus, of Marlborough College, to the Medical Times and Gazette, March* 17.)

It is generally found that a salt of the protoxide of iron is preferable to one of a higher degree of oxygenation; but it is also difficult to obtain an absolutely permanent salt of the protoxide. Perhaps, without exception, the sulphate is the most practically useful of all the salts of iron, owing to the uniformity of its composition. Of the quinine salts, the sulphate is also the most available for general purposes. It is not difficult to form a simple combination of these two sulphates, but the resulting compound is not well fitted for general use. The addition, however, of a certain proportion of sulphate of magnesia, enables us to obtain a salt which is nearly as soluble as the sulphate of magnesia itself—quite unalterable in the solid state, and forming a solution perfectly clear at first, and remaining so for an indefinite period. The iron has no tendency to a further state of oxygenation; the solution has been agitated with oxygen gas, and kept in contact with it for several days, without the least change. A solution of gallic acid tinges a solution of the salt of light bluish colour after the lapse of two or three days, and many substances which produce an inky compound with the salts of iron may be mixed with it without causing any change of colour.

The proportion of the three sulphates which has been adopted, is 80 per cent. of sulphate of magnesia, 15 per cent. of sulphate of iron, and 5 per cent. of sulphate of quinine, one scruple containing 16, 3, and 1 grains of the respective salts. These proportions have been found the best for general use, and also for the purposes of manufacture. The proportion of quinine may be increased by prescribing an additional quantity which is readily soluble in the solution of the salt.

One peculiarity is especially deserving of notice; namely, that in this combination the assisting or adjuvant property of both iron and quinine are remarkably developed, the effect of both, particularly of quinine, being heightened in a very marked manner. At the same time, both of the remedies are less apt to disagree with peculiar constitutions which ordinarily refuse to tolerate either iron or quinine. If the heightened power be borne in mind in prescribing this combination, there will be very few cases found in which it will not be suitable whenever either iron or quinine are indicated.

SPERMACETI OINTMENT, &c.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—I cannot help thinking that this subject is assuming the position of the chameleon, and that the different correspondents who have handled it are all right and all wrong.

One informs us that he has succeeded in convincing his customers that however white spermaceti may be, it is not desirable that its ointment should retain its unsullied hue; another ranks whiteness, lard, and rancidity as sequent qualities; and Mr. Barnes, at page 353, extols the virtues of bees'-wax, and disapproves of the Pharmacopœia directions to use *white* wax.

Now, as we have had an intimation that the forthcoming Pharmacopœia is to be published in English, why should not the public be favoured with spermaceti ointment white as the material from whence it obtains its name, and also with bees'-wax ointment as unbleached as the most ardent of your correspondents could desire?

I am sure the public would soon determine which they preferred. Most undoubtedly an unbleached ointment is liable to become rancid, and a well-made white ointment may be free from lard and from rancidity, nor would I exclude lard from the Pharmacopœia as some of your correspondents are inclined to do.

I am, Sir, &c.,

137, *Broad Street, Birmingham, February 5th*, 1861. JOSEPH LEAY.

UNGUENTUM HYDRARGYRI NITRICO-OXYDI.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—I quite agree with your correspondents who advocate strict adherence to the Pharmacopœia in the manufacture of Ceratum Cetacei. I cannot, however, understand on what principles some unguents are ordered to be made with bleached and others with unbleached wax, seeing that all keep much better when the latter is used, and none more so than the Ung. Hyd. Nit. Oxydi. I have, in this instance, for years substituted yellow for white wax. The colour is, of course, not quite so brilliant, but this is more than compensated by its freedom from decomposition, and its non-liability to stain from using an iron spatula.

Yours, &c.,

Lower Road, Islington, Feb. 16th, 1861. THOS. A. BARBER.

POISON LABELS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—I take it for granted, from recent discussions, that there is a strong feeling on the part of an influential section of the medical profession, and of the public, in favour of additional precautions in the use of dangerous substances; and, especially, that it is desirable for vessels containing them, to be readily distinguished from others by the touch as well as by the sight.

There appears, however, to be much difficulty in bringing into general use any contrivance, however ingenious, which is not applicable to ordinary bottles. I wish, through your estimable Journal, to submit for the discussion of those most capable of judging of the question practically, in its numerous bearings, whether the object sought may not be attained, at least to a great extent, by a modification of the label. For instance, the ordinary caution label, "Poison," or "For external use only," might have a broad black or coloured margin, either very deeply embossed, or covered with some rough substance dusted on an adhesive surface; this, or some similar plan, would ensure that the mere act of taking hold of the bottle would be accompanied by the warning that the contents were dangerous. When empty, the label could be washed off, and, which is most essential, with the danger would disappear the warning. On the other hand, any special form of bottle would often be used to contain harmless substances, and thus its warning might easily come to be disregarded.

We look to the Pharmaceutical Society as at once best able to judge of the suitableness of any such contrivance, and to bring it into general use. In their hands, through you, Sir, I place this suggestion *valeat quantum*.

I am your obedient servant,

March 22nd, 1861. M. D.

MISCELLANEA.

Coloured Rain.—M. Giovanni Campani, Professor of Chemistry at the University of Siena, has published a letter, addressed to Professor Matteucci, on a singular phenomenon which occurred at Siena in December last. On the 28th of that month, about 7 A.M., the inhabitants of the north-western part of the city witnessed a copious fall of rain of a reddish hue, which lasted two hours; a second shower of the same colour occurred at 11 A.M., and a third at 2 P.M., but that of the deepest red, fell the first time. It was entirely confined to that particular quarter of the town, and so nicely was the line drawn that the cessation of the red colour was ascertained n one direction to be at about 200 metres from the meteorological observatory, the

pluviometer of which received colourless rain at exactly the same time. The temperature during the same interval varied between 8 deg. and 10 deg. Centigrade, 46 and 50 Fahrenheit. The wind blew from the S.W. at the beginning of the phenomenon, and afterwards changed to W.S.W. None of the rural population in the immediate vicinity of Siena remarked the occurrence, so that most probably the rain that fell round the town was colourless. The same phenomenon recurred in exactly the same quarter of the town on the 31st of December, and again on the 1st of January, the wind being W.N.W., and the temperature respectively 35 and 39.42 deg. Fahrenheit. Each time, however, the red colour diminished in depth, its greatest strength having at no time exceeded that of weak wine and water. A similar occurrence is recorded as having taken place in 1819 at Blankenburg, when M.M. Meyer and Stopp found the water to contain a solution of chloride of cobalt. Professor Campani, who is now engaged, in conjunction with his colleague, Professor Gabrielli, in analyzing the red water collected, has ascertained that in this instance it contains no chloride of cobalt, and that the colour must be owing to some solution, since the water has deposited no sediment.

Hæmatine as a Test in Forensic Medicine.—Hæmine and Hæmatine do not present as yet the slightest pathological interest; but, on the other hand, they have proved of very great importance in forensic medicine on account of their having been recently employed as one of the surest tests for the examination of blood-stains. I myself have been in a position to make experiments of this sort in forensic cases. For this purpose the best mode of proceeding is to mix dried blood in as compact a form as possible with dry, crystallized, powdered common salt, and then to add to this mixture glacial acetic acid, and evaporate at a boiling heat. When this has been done, crystals of hæmine are found where the blood-corpuscles or the substance previously lay, in which the presence of hæmatine was doubtful. This is a reaction which must be ranked among the most certain and reliable ones with which we are acquainted. There is no other substance in which we know such a transformation to take place but hæmatine. This test is extremely important, because it is applicable in the case of extremely minute quantities, only they must not be spread over too large a surface. It would therefore not be easy of application in a case where we had to deal with a cloth which had been dipped into a thin watery fluid coloured with blood. Yet I was able, in the case of a murdered man, on the sleeve of whose coat blood had spurted, and where some of the drops were only a line in diameter, from these minute specks to produce innumerable crystals of hæmine, though of course microscopical ones. In cases in which the ordinary chemical tests would necessarily absolutely fail on account of the smallness of the quantity, we are still able to obtain hæmine.— *Virchow's Cellular Pathology.*— *Medical Times and Gazette.*

Stramonium in Neuralgia.—In the *Chicago Medical Examiner*, Dr. A. Young says of neuralgia:—"I have to meet with the first instance that has failed to yield to stramonium." "The mode in which I have given it in the intermittent form, is gr. j. of Tilden's ext. stramon. fol., every two or three hours during the intermission, until the system is decidedly affected, indicated by dilated pupil, disordered vision, vertigo, and often hallucinations, or mild delirium. When given to this extent, it will generally be found unnecessary to repeat it. Anything less than this will be of comparatively little value."

Chloroform Liniment in Toothache.—Take the white of an egg, and add an equal bulk of chloroform, and digest four hours at an ordinary temperature. Apply this to the gum, immediately above the aching tooth, by saturating a piece of lint, over which is to be placed a second piece of dry lint, larger than the first, in order to protect the lips, which are to be allowed carefully to fall on the two in order to retain them in their places. We have found this invaluable in the relief of such disturbances as are not dependent on fully developed inflammation, such as neuralgia disturbances, and the first stages of periostitis. A more powerful liniment can be made by taking one part of white of an egg and four of chloroform, placing them in a bottle, which is to be completely plunged into a water-bath at from 120° to 140°. Gelatinization takes place in four minutes. This is to be rubbed on any painful part, and great relief is produced. The slow cauterization it gives rise to, and the

protection of the part from the atmosphere, render it a very powerful counter-irritant. The cold preparation is perhaps the best and easiest made, and when a decided effect is required, it should be repeatedly used.—*American Journal of Dental Science*, October, p. 595.

Tar and Copaiba Capsules.—This combination, which has been proposed by M. Ricord to the Academy of Medicine, is used in the treatment of gonorrhœa. These substances are said to neutralize each other's noxious tastes. The following is the formula:—Take 7lb. 4oz. of copaiba, 7oz. of Norwegian tar, and 5oz. of calcined magnesia, to make 4000 capsules. Dose, 15 capsules per diem.

M. Ricord also combines copaiba with pepsine and bismuth, to prevent the drastic effects of the balsam. Take 5lb. 7oz. of copaiba, 1lb. 3oz. of neutral pepsine, 4oz. of trisnitrate of bismuth, and 6oz. of calcined magnesia, to make 6000 capsules. Dose, from 15 to 18 per diem.

Quack Advertising.—The authorities at Aix-la-Chapelle have prohibited all advertisements, either in newspapers, or as bills fixed on walls or otherwise circulated, of therapeutical substances offered as remedies in disease, either for man or beast, under a penalty of thirty shillings.—*Dublin Medical Press.*

Poisoning by Arsenic.—The crew of the Boxer, of Colchester, a vessel lying in the Tyne, have had a narrow escape from death. On the night of February 19th, a messenger was sent hastily ashore for a medical man, as the master, mate, and five of the crew had been seized with a serious illness. Dr. Emmerson proceeded promptly aboard, and at once saw that the men were labouring under the effects of poison, and administered antidotes to them, and with care they were soon out of danger. The master and men, it seems, had partaken of a pudding for dinner, and were shortly after attacked by the dangerous symptoms. The cook, who made the pudding, had taken the flour for it from a locker, and on searching the locker a parcel of arsenic was discovered. It seems that the parcel had been found in the cabin, and the mate, imagining that it was flour, had put it into the flour locker. The cook, on going for the flour for the pudding, had thrust his scoop into the parcel, but, not liking the contents, he had withdrawn the scoop, and had taken his flour for the pudding from the usual source. Some particles of the arsenic had adhered to the scoop and got mixed up with the flour, and had occasioned all the mischief. The poison had been on board the ship two years unknown to the master, and was the remaining quantity of a parcel sent aboard to destroy worms in the ship's bottom.

Suicide by Cyanide of Potassium.—On Saturday, March 2nd, an inquest was held at the Horse and Groom, Church-lane, Whitechapel, on the body of Samuel Goldman, aged 19, who committed suicide by poison. It appeared from the evidence that the deceased was a photographic artist, and had been in an unsettled state of mind for some months past. He proceeded to the house of a friend, where he asked for the loan of a bottle, which he said he required to get a small quantity of brandy. This was refused, when he left, and subsequently returned in a state of great pain. He fell down upon a bed, and said, "I am dying." A surgeon was sent for, who pronounced the deceased to be suffering from the effects of a powerful irritant. Antidotes were administered, and the deceased, having been placed in a cab, was conveyed home, where he lingered for several hours. The deceased admitted that he had taken a quantity of cyanide of potassium. A police-constable of the H division found a bottle in the deceased's pocket, and a letter addressed to his parents, in which he begged of them to forgive him.—Verdict, "Temporary insanity."

Suicide by Essential Oil of Almonds.—An inquest has been held before Mr. Payne, coroner for the city of London, on the body of Thomas Richardson, aged 37, lately a private in the 7th Regiment, stationed at Chatham, who died from the effects of essential oil of almonds and opium. It appeared from the evidence that the deceased had left his regiment on the 28th of February, on leave of absence, but did not return. He had been staying at a lodging-house in Union-street, Bishopsgate, with a woman said to be his sister, and both appear to have agreed to take poison, the deceased from the fear of being punished as a deserter.

Mr. Robert Fowler, surgeon, who was called in, stated that there was a smell of

prussic acid in the room, and the vapour of that poison was escaping from the mouth. The woman informed witness that the deceased mixed opium with the oil of almonds, and, dividing it into two doses, he gave her one, which she drank, and swallowed the other himself. With the former the poison produced sickness, and was not fatal.

Mr. Hackman, chemist, Union-street, Bishopsgate, stated that he supplied 15 grains of opium to the deceased, who said that he had been in the habit of taking it in India. Witness labelled the opium "Poison," and cautioned the deceased as to its use. The jury returned a verdict of *Felo de se.*

On Thursday, February 7th, the woman, Sarah Rose Terry, was brought before Mr. Alderman Rose, on the charge of aiding and abetting the suicide of Thomas Richardson, and also of making an attempt on her own life, and has been committed for trial.

Suicide by Opium.—On Saturday, March 23, Mr. Walthew, deputy-coroner for East Middlesex, held an inquest at the London Hospital, on the body of John Bride, aged 48, a medical practitioner, residing in High Street, Shadwell. Deceased suffered from disease of the heart, for which he was in the habit of taking chloric ether. On the evening of Tuesday last he was discovered to have taken a large quantity of opium, and although he was removed to the London Hospital, and every effort used to save his life, it was ineffectual. The jury returned a verdict of Temporary insanity.

TO CORRESPONDENTS.

C. J. S. (Frome).—Candidates, not previously examined, on passing the Minor will be examined as to their preliminary general education; the fee for registration is five guineas. The certificate of age to be obtained from the usual source.

A Chemist's Assistant (Brentwood).—Assistants, in order to participate in the privileges of the Pharmaceutical Society, must pass the Minor Examination, the fee for which is five guineas.

A Constant Reader (Aylesbury).—We have never given any opinion respecting the preparations alluded to; consult any duly qualified medical practitioner.

F. P. (Chard).—Royle's *Materia Medica.* Bowman's *Introduction to Chemistry.*

J. M. (London).—The words alluded to imply a recommendation for a particular disorder, and, therefore, render the preparation which they describe liable to the Patent Medicine Stamp Duty. See *Pharmaceutical Journal* for October, 1854, where the law on the subject is clearly defined.

J. E. R. (Manchester).—The price of a copy of the "*Paris Codex*" is 12*s.*, which may be obtained through any bookseller.

P. C. (Brighton).—In the prescription referred to the powders are intended to be mixed with the water, to form a gargle measuring one pint.

R.A.P.S. (Brighton).—We do not know any work that will supply the place of the one you mention. (2.) No prizes were awarded this year. (3.) The subject has been frequently discussed in this Journal, see vol. xiii., page 349. (4.) It is uncertain, but certainly not before October next, and probably not so soon. (5.) *Bentley's Manual of Botany*, published by Churchill, price 12*s.* 6*d.*

T. B. (Weymouth).—*Granular Citrate of Magnesia.* Vol. i. (2nd series), page 301.

H. T. (Dorchester).—Apply by letter to the Secretary, 17, Bloomsbury Square.

An Associate (London).—*Tinctura Quinæ Composita.*—If digested for seven days, as directed in the Pharmacopœia, the disulphate of quinine is almost entirely dissolved.

C. B. (Exeter).—Carbolate of lime is made from coal tar by a patented process.

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, Elias Bremridge, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. Churchill, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.

SECOND SERIES.

VOL. II.—No. XI.—MAY 1st, 1861.

THE CENSUS—NATIONAL AND PHARMACEUTICAL.

At a great national cost we have entered upon, and are still engaged in completing, one of the periodical processes, instituted among us in the present century, of counting and classifying the people; and the results, to which all are looking forward with some degree of interest, will be especially important as a basis for future legislation.

The census was an institution of the Romans, among whom the numbering of the people was effected at intervals, generally of five years. The Roman censors possessed extensive and arbitrary powers, which enabled them to inquire not only as to the name, age, and occupation of all the inhabitants, but also as to the value of their property, and even as to their manners and morals. Every Roman citizen was required, upon oath, to give the information called for, and the punishment for a false return was confiscation of goods and loss of personal liberty.

In more modern times the census, as now established in this and other countries, is of comparatively recent introduction. The first attempt to ascertain the population of England was made in the last century, but no efficient means were then adopted for the purpose, and the result was therefore unsatisfactory.

In the United States of America, it was provided, among the articles of the Federal Constitution, that a census of the people should be made within three years after the first meeting of Congress, and within every subsequent term of ten years. The first American census was taken in 1790.

In France, the measures adopted for keeping a correct register of the population date from 1791, since which time the results have been published every ten years.

In 1801 the first actual enumeration of the people was effected in England and Scotland, and it has been repeated every ten years since that time, the present being our seventh census. The enumeration of the population of Ireland was not made until 1813; but it has since been effected simultaneously with that of Great Britain.

When the returns, which have just been made, are worked out and classified, we shall have a vast amount of valuable information, with reference to which it may be stated that the mere determination of the aggregate number of the population will be one of the least important results. It is certainly interesting to know what we number, and whether, as compared with ten years ago, we have increased or diminished, and to what extent. But the relations of sexes, ages, and occupations, of which the returns will afford information, will be far more important as indicating the condition of the people. In the absence of correct statistical information, such as the census and the register of births, deaths, and marriages afford, there would be no safe basis for much of our legislation. In ancient Rome, the levying of the taxes was based upon the census returns, and so it should be, to a certain extent, in the present day. There is a certain proportion of the population consisting of those who may be appealed to for contributions in the form of direct taxation, while another part can only be made to contribute through indirect taxation. The census affords some indication of the relative proportion of these, and thus aids the Legislature in the adjustment of the burden of State expenses.

While the national census is thus made the basis of national legislation, may

we not find within narrower limits application for a similar principle? If correct knowledge of the extent and nature of a population is required, in order rightly to adjust the burdens of State taxation, will it not be so also with regard to corporate bodies? May not the national census suggest a pharmaceutical census? The last number of this Journal contains the financial statement of the Pharmaceutical Society for the year 1860, and comparing it with the corresponding statements for previous years, some questions arise which call for serious consideration. It may be asked, "Does the financial statement afford a correct indication of the strength of the Pharmaceutical Society with regard to numbers?" And the answer to this question will be in the negative. Those who now enter the Society by examination are not called upon by the bye-laws to pay an annual subscription, as the fee of five guineas, paid on admission, entitles them to the privileges of membership for life; and according to the existing regulations they continue to receive the Journal of the Society without any further payment. These members, as well as associates and registered apprentices by examination, do not, with the exception of those admitted during the current year, in any way appear in the financial statement. We cannot, therefore, estimate the numerical strength of the Society from this document. The members and associates may be classed under several different heads. Thus, we have—

1. Members who have paid a composition fee of twenty guineas, under the original bye-laws.
2. Members who have paid a composition fee of ten guineas, under the existing bye-laws.
3. Members paying an annual subscription of one guinea, admitted before 1853.
4. Members who have paid a composition fee of five guineas, admitted by examination since 1852.
5. Associates paying an annual subscription of half a guinea, admitted before 1853.
6. Associates who have paid the examination fee of three guineas if previously registered, or of five guineas if not registered, admitted since 1852.
7. Registered Apprentices paying an annual subscription of half a guinea, admitted before 1853.
8. Registered Apprentices who have paid the registration fee of two guineas, admitted since 1852.

Of these several classes only Nos. 3, 5, and 7 appear from year to year in the financial statement, and the numbers representing them are necessarily decreasing, as no fresh additions can now be made, and their ranks are annually thinned by death and other causes.

As the old annually subscribing Members, Associates, and Registered Apprentices, are thus gradually passing away, it becomes a very important question how far those admitted under the existing laws will supply their places, not only in maintaining the numerical strength of the Society, but also and especially in affording the means of carrying out and supporting in an active and efficient state the institution which has been established and brought to maturity at the cost of so much labour and capital, and which has hitherto proved a powerful agent in promoting the great objects of protection to pharmaceutical interests and the advancement of pharmaceutical knowledge.

The Society at present owes its support principally to the annual subscribers. Can it be maintained when this means of support has ceased, and the income of the Society is derived from the fees of those annually examined and admitted into membership? This question has already occupied the attention of the Council, and it demands the serious consideration of the Members of the Society generally. Some new adjustment of the means of providing an income adequate to the requirements of the Institution will be necessary, but what the nature of

this adjustment shall be has yet to be decided. It has been suggested that those admitted into the Society by examination should in future pay annual subscriptions, instead of the composition fees required by the existing bye-laws, and that a new scale of fees should be charged for attendance at lectures. It is also considered that Chemists of known competence, who were occupied in the business prior to the passing of the Pharmacy Act, and are therefore of equal standing with Members who were admitted into the Society at that time, should have their request to be received into membership without examination acceded to, by some change in the bye-laws. These questions will probably be discussed at the Annual Meeting, and some specific propositions will, we believe, be submitted to a Special General Meeting to be convened for that purpose.

THE ALCHEMIST AGAIN.

NATURAL OXIDE OF SILVER.

The Hungarian's project for making silver, to which we referred in our last number, has been followed by announcements hardly less startling, which have appeared in the *Times* and elsewhere, to the effect that large quantities of silver may be extracted at a small cost from certain refuse ores occurring abundantly in Cornwall and other places. These announcements have been made by anonymous correspondents, who state that recent experiments have proved the existence of natural oxide of silver "in enormous quantities in the neighbourhood of the ordinary metallic silver deposits." One of these correspondents states—

"The importance to this country generally, and to the county of Cornwall in particular, of this most interesting discovery it is impossible to over-estimate. There are millions of tons of gozzan in Cornwall, all known to contain silver, but believed to contain it in such small quantities as to be worthless, which may be worked under this discovery to an enormous profit. In Russia, silver ores containing four ounces of silver per ton are worked profitably, In Mexico, where labour is dearer, the lowest yield is five ounces; taking a comparative statement for the higher wages of England, it would not pay to work ores containing silver only in less quantity than 10oz. to 12oz. The Cornish gozzans are known to contain from 5oz. to 13oz. on the average in their natural state, but it is proved that in the form of oxide they contain from 54oz. to 216oz., according to the average of the trials yet made, while some have been found to be fabulously richer. It follows that if an average yield of 12oz. could be worked without loss—an average the lowest yet obtained by the process of reduction now adopted, 54oz. would yield an immense profit—the expense of raising, reducing, and crushing these neglected ores could not exceed £3 per ton, while the value of 54oz. of silver only would be over £13, and that of the average yet obtained over £35 per ton."

This glowing representation is based upon the assumptions, first, that a discovery has recently been made of the existence of oxide of silver among the naturally occurring combinations of this metal; and, secondly, that in the state of oxide the silver has hitherto escaped detection in the deposits referred to, while no evidence or authority is adduced in support of these representations. It is altogether an improbable story, and the publication of such anonymous statements in the pages of a newspaper is much to be regretted. We expect to find it followed by a proposition to establish a company for the production of silver from ores which are to be got for nothing, with flattering prospects of enormous fortunes to be derived from such investment.

TRANSACTIONS

OF

THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, 3rd *April*, 1861,

Present—Messrs. Bird, Bottle, Bucklee, Davenport, Deane, Edwards, Evans, Hanbury, Haselden, Hills, Lescher, Mackay,* Meggeson, Morson, Sandford, Squire, and Waugh, the following were elected

MEMBERS.

MANCHESTER.....William Cowl
DUMFRIES .....William Allan

SPECIAL MEETINGS OF COUNCIL, 10*th April.*

Present—Messrs. Bucklee, Davenport, Deane, Edwards, Hanbury, Haselden, Herring, Hills, Lescher, Meggeson, Morson, Sandford, Squire, and Waugh.

17*th April.*

Present—Messrs. Bird, Bottle, Bucklee, Davenport, Hanbury, Haselden, Herring, Hills, Hollier, Lescher, Meggeson, Morson, Sandford, Squire, Standring, and Waugh.

24*th April.*

Present—Messrs. Bird, Bottle, Davenport, Deane, Evans, Hanbury, Haselden, Hills, Hollier, Lescher, Morson, Sandford, Squire, and Waugh.

MAJOR EXAMINATION, 16*th April*, 1861.

Birch, Henry Cooper.....Richmond, Surrey
Fowler, Stanley .....Dover
Grindley, William.....Chester
Towers, Robert .....Ulverston

MINOR EXAMINATION.

Ambrosse, John David Long .....Putney
Ekin, Charles.....Maidstone
George, John Evan .....Newcastle Emlyn
Hughes, Roger.....Chester
Lescher, Frank Harwood.....London
Winterbottom, James .....Oldham

REGISTERED APPRENTICES.

NAME.	RESIDING WITH.	ADDRESS.
Barrett, James	Mr. Merryweather	Leicester
Dale, George	Mr. Dale	Chichester
Fitt, Francis Edward	Mr. Fitt	Barking
Griffith, William Henry	Messrs. Ferris & Co.	Bristol
Holden, Abraham Hobson	Mr. Handley	Wakefield
Severs, Joseph	Messrs. Harvey & Reynolds	Leeds
Welch, Thomas Kemp	Messrs Randall & Son	Southampton
Wilson, Thomas	Messrs. Sutton & Cornell	Stowmarket

* Elected Member of the Council in the place of Mr. Macfarlan, deceased.

PHARMACEUTICAL MEETING.

Wednesday, April 3d, 1861.

MR. T. N. R. MORSON, PRESIDENT, IN THE CHAIR.

DONATIONS TO THE LIBRARY AND MUSEUM

were announced as follows:—

Illustrations of the Nueva Quinologia of Pavon. Part 7. From the Author, J. E. Howard, Esq.

A Course of Chymistry. By Nicholas Lemert. 1677. From Mr. Edward Jeynes.

Proceedings of the Linnean Society. From the Society.

Quarterly Journal of the Chemical Society. From the Society.

The Journal of the Society of Arts. From the Society.

Assurance Magazine. From the Society of Actuaries.

The Chemist and Druggist. From the Editor.

The Technologist. From the Editor.

The British Journal of Dental Science. From the Editor.

Specimens of two *Fungi* used in Indian medicine, viz. *Sclerotium stipitatum* Berk. et Curr. and *Mylitta lapidescens* Horan. From Dr. E. J. Waring, Trevandrum, Travancore.

Specimens of *Mylitta lapidescens* Horan. from China, and of *Pachyma Cocos* Fries, from Japan. From Mr. Daniel Hanbury.

The following Papers were read:—

ON THE PREPARATION OF SMELLING-SALTS.

BY MR. ALFRED ALLCHIN.

There is, perhaps, no operation in our daily avocations that we are more frequently called upon to perform than that of preparing smelling-salts, and yet I do not recollect to have seen any formula published that would convey the means of doing so in a perfectly satisfactory manner.

I have for some years been in the habit of making smelling-salts by a process which, I believe, possesses so many advantages, that I venture to bring it before the notice of the Pharmaceutical Society, thinking that it will probably interest some of the members.

I will first describe exactly the process I adopt, and afterwards give the chemical explanation of the process.

Take of good commercial sesquicarbonate of ammonia 40 avoirdupois ounces, break it into small pieces, the largest of which should not exceed in size that of a filbert, and put it into a chemical air-tight jar having a capacity of half a gallon. Then pour over it 20 fluid ounces of strong solution of ammonia (sp. gr. .880), previously perfumed according to taste, and immediately fix on the lid of the jar, taking care that it is properly secured, and keep it in a cool place, stirring the salt with a stiff spatula every other day for a week. Afterwards allow it to remain for two or three weeks, at the expiration of which time it will have become hard—so hard, indeed, that if the precaution of stirring the salt were neglected, it would be almost impossible to remove it without breaking the jar.

The period during which the salt should be left in the closed jar sometimes varies a little, but if at the expiration of three weeks from the time at which the mixture was made it has not become sufficiently hard, it should be allowed to remain for a few days longer, and then put into a mortar and reduced to coarse powder, so as to admit of its being readily introduced into any ordinary smelling-bottle.

When thus prepared, I generally keep it in well-stoppered bottles, each containing one or two pounds' weight, and in this state it improves by keeping. In

using it for filling smelling-bottles, after putting the dry salt into the bottle a further quantity of the *volatile essence* should be added, in the proportion of about one drachm to an ounce of the salt. After making this addition the mixture will assume a crystalline appearance, somewhat resembling salt of tartar, and it is in this state that I consider it to be in the best condition for use. It is strongly, but pleasantly, pungent, and continues to be so almost as long as any of the salt remains in the bottle.

The perfume that I have used is that recommended by Dr. Redwood, in his *Supplement to the Pharmacopœia*, and is as follows:—

Take of,

English Oil of Lavender, } each ʒiv.
Essence of Musk, }
Oil of Bergamot, ʒij.
Oil of Cloves, ʒj.
Otto of Rose, gtt. x.
Oil of Cinnamon, gtt. v.

This quantity is added to an imperial pint of strong solution of ammonia.

I will now give the data upon which this process is founded.

Sesquicarbonate of ammonia consists of—

2 equivalents of ammonia,	17 × 2	=	34
3 equivalents of carbonic acid,	22 × 3	=	66
2 equivalents of water,	9 × 2	=	18
			118

Now, to get good smelling-salts it is necessary to convert this sesquicarbonate into neutral carbonate of ammonia, and in order to do this we must introduce half as much more ammonia as it already contains. This is done by the addition of a strong solution of ammonia, but there are probably few persons who, in adding the *Liquor Ammoniæ*, are aware of the quantity required, or of the circumstances under which the union is effected and the most satisfactory result obtained. On referring to Dr. Dalton's table of the quantities of ammonia contained in *Liquor Ammoniæ* of different specific gravities, it will be found that strong solution of ammonia, of sp. gr. .880, which nearly corresponds with the *Liquor Ammoniæ Fortior* of the Pharmacopœia, contains 27.3 grains of ammoniacal gas in 100 grains of the solution. Now, as 118 grains of sesquicarbonate of ammonia contain 34 grains of ammonia, and require the addition of 17 grains more to convert it into neutral carbonate, we must use 62.2 grains of strong solution of ammonia to supply the required quantity. In my process I have ordered only 59 parts of *Liquor Ammoniæ* to 118 parts of sesquicarbonate, but the further addition which is directed to be made when the salts are put into a smelling-bottle will rather more than make up the theoretical quantity, giving a slight excess of free ammonia.

Liquor Ammoniæ of other strength than that I have indicated might be used in equivalent quantity, but not, I think, without disadvantage. By using the solution of sp. gr. .880, which very nearly corresponds with the stronger solution of the Pharmacopœia, we are enabled to convey to the sesquicarbonate the required quantity of ammonia without adding so much water as to liquefy any portion of the salt, and without danger in conducting the process. It may not be out of place to mention, as a precaution, that the strongest *Liquor Ammoniæ* boils at a temperature below 70° Fahr., so that considerable care is necessary in using large quantities of this solution, and also in preserving the store bottles in a cool place.

In the third volume of the *Pharmaceutical Journal*, at p. 265, a formula is given for Preston salts, which, I believe, is very commonly adopted. It is to

fill the bottles with sesquicarbonate of ammonia in small pieces, and then to add one drachm of volatile essence to each bottle. Now, Preston salt bottles hold, as nearly as possible, one ounce of sesquicarbonate of ammonia, which quantity, I think I have shown, would require nearly five drachms of strong solution of ammonia to convert it into neutral carbonate. The common method of adding volatile essence or strong solution of ammonia to the sesquicarbonate at the time of filling a smelling-bottle for immediate use is subject to two objections, first, that the solution is not thus added in sufficient quantity, and secondly, that the ingredients are not confined together for a sufficient length of time to ensure their union, before the bottle has been frequently opened, and much of the ammonia allowed to escape. In the process I have recommended these objections are obviated, and a product is obtained which is fit for immediate use, and which is volatile and pungent almost as long as any of the salt remains.

Mr. Squire objected to the use of oil of cloves in the perfume used by Mr. Allchin, as it assumed a dark brown colour in contact with the ammoniacal salt, which was often objected to. This effect was observed also in spirit of sal volatile when cloves were used in its preparation as ordered in the present London Pharmacopœia. He wished to know why Mr. Allchin had employed aqueous rather than alcoholic solution of ammonia in his process. He (Mr. S.) preferred the alcoholic ammonia for the purpose, and thought it yielded better smelling salts. The cheap fig-shaped smelling-bottles imported from abroad ready filled, contained alcoholic and not aqueous ammonia, as he had ascertained by experiment.

Mr. Waugh agreed with Mr. Squire that the dark colour caused by the use of oil of cloves in the specimen before the meeting was objectionable. He found a decided preference given by the public to light-coloured smelling-salts provided the perfume was agreeable. He thought, too, the alcoholic solution of ammonia was better suited than the aqueous solution for adding to the pungency of the salts. He would be glad to know whether Mr. Allchin had tried the effect of it in his process.

Mr. Allchin said he had not tried alcoholic ammonia, but thought it would not answer so well as the aqueous solution, as it contained much less ammonia. The strength of *Liquor Ammoniæ* had been accurately determined, and as commonly kept it contained sufficient ammonia to admit of its application in his process, but this was not the case with the alcoholic solution of ammonia.

Dr. Redwood thought Mr. Allchin's process a very good one for the production of carbonate of ammonia suitable for filling smelling-bottles. It was well known that ordinary sesquicarbonate of ammonia soon lost its pungency when exposed to the air, in consequence of its being resolved into the volatile and pungent monocarbonate which escaped, and the comparatively inodorous bicarbonate which remained as a useless residue in the bottle. It had been proposed to obtain the monocarbonate for use as smelling-salts by submitting sesquicarbonate of ammonia to a sort of fractional distillation; but this process was not, he believed, practically carried out. Attempts were made to accomplish the same object, but very imperfectly, by adding a strong solution of ammonia to the sesquicarbonate when the latter was put into a smelling-bottle. Mr. Allchin's process was but a modification of this latter method, but it had the merit of pointing out the conditions upon which a successful result depended. The question of perfume was, he thought, of secondary importance, as there would necessarily be a difference of opinion, and each one could exercise his taste with regard to the perfume used.

Mr. Bartlett observed, with reference to the colour of smelling-salts to which allusion had been made, that he found a brown colour preferred by his customers.

Mr. Platt said a method was sometimes adopted in filling smelling-bottles, which consisted in adding a mixture of muriate of ammonia and carbonate of potash to the ordinary sesquicarbonate of ammonia.

Mr. Waugh thought as they were there as practical men discussing a practical subject, he might mention another method which was resorted to for increasing the volatility of sesquicarbonate of ammonia in smelling-bottles, which was, merely to mix a little carbonate of potash with the ammoniacal salt, and then to add alcoholic ammonia. He presumed the result in this case would be similar to that obtained by Mr. Allchin's process.

Dr. Redwood thought the addition of a deliquescent and very soluble salt was objectionable, and although in the case referred to by Mr. Waugh the carbonate of potash would no doubt take carbonic acid from the sesquicarbonate of ammonia, and render the latter more volatile, he did not think the mode of accomplishing the object was so convenient or elegant as that proposed by Mr. Allchin.

The Chairman expressed the thanks of the meeting to Mr. Allchin for his communication. His process appeared to be well adapted to effect the required object, and it was one which every Chemist could easily perform. He thought aqueous ammonia would be found preferable to alcoholic ammonia, as it might be obtained much stronger and more definite in strength, and especially as the water became solidified in the resulting salt.

ON THE PREPARATION OF TINCTURE OF ACTÆA.

BY MR. A. F. HASELDEN.

After the excellent paper which appeared in the Journal from Professor Bentley, I feel that I can have nothing to add upon the root of Actæa racemosa, but I may offer a word upon the tincture, which appears to be the preparation most likely to come into use. I have here two samples of tincture, one prepared by maceration, the other by displacement or percolation, and if asked to which of the processes I should in this particular instance give the preference, I should decide in favour of displacement. The Actæa appears to me to be precisely one of the substances in which this mode of operating would be most advantageous; it is tolerably hard, and does not when macerated swell so as in any way to impede the process. It is only necessary to grind it sufficiently fine, let it soak for a couple of hours in a portion of the menstruum, then pack it carefully, evenly, and firmly, with a reasonable amount of pressure, and then proceed with the work, and in twenty-four hours or less, you have a good clear tincture, improved certainly in appearance by filtration, with the full measure of menstruum as originally used, and without any of the trouble or waste incurred by pressing.

There is also one little point which I would mention, namely, that by neither process is the quantity of menstruum employed sufficient to exhaust the quantity of root as given in the formula published in the Journal, for I have here the product from the dregs of eight ounces of root which had been treated by maceration and pressure and then percolated with four ounces of proof spirit, and a very respectable tincture is the result; and again I have the product obtained by treating twelve ounces with water after it had undergone the displacement process, and the full quantity, and indeed more than the quantity of tincture had been obtained. The result is a very dark, bright solution, in smell very much resembling the liquor taraxaci. The effect of this is to show that the water extracts a large amount of colouring matter which the spirit does not, and the spirit a resinous and strongly flavoured extractive, which the cold water alone would not, therefore the proof spirit would seem to be the best menstruum, although the quantity of root prescribed is not entirely exhausted. There is

yet another point which may be worthy of consideration; as this medicine is more likely to find its way into the provinces, for the present at least, in the shape of tincture rather than root, I should have been glad if I could have offered any distinctive test by which it might have been recognized, but at present I cannot; those employed by Professor Bentley in testing the infusion of the root, although excellent for that purpose, are of little value when applied to the tincture, but having attentively once examined the tincture by taste and smell, its peculiar flavour and odour would scarcely fail to be remembered and recognized upon a future occasion.

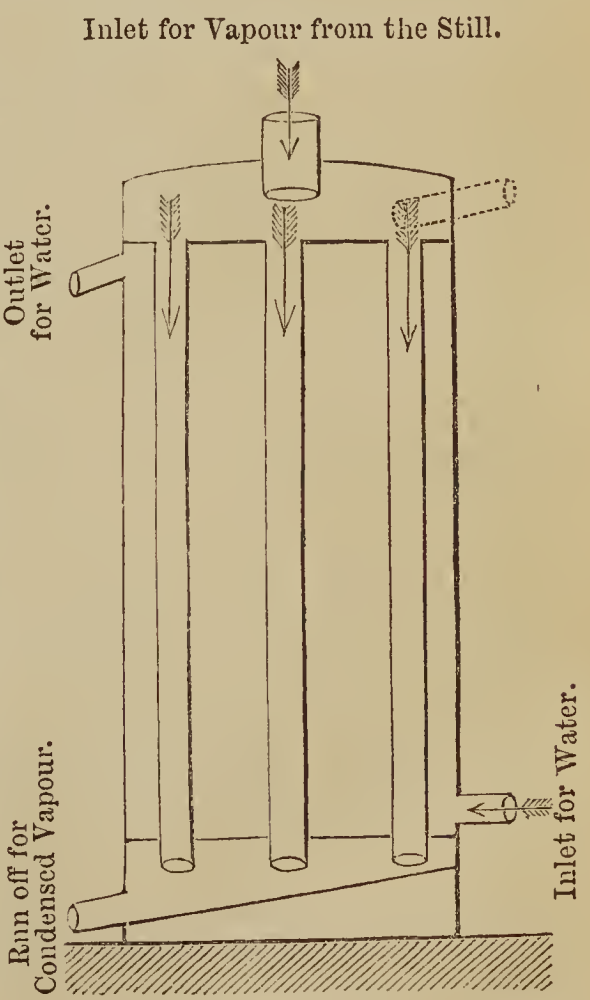
Mr. SQUIRE inquired if the specific gravity of the two tinctures, made respectively by maceration and displacement, had been taken, and he also wished to know why the residue had been treated in the one case with proof spirit, and in the other with water, as this prevented a comparison being made of the two products.

Mr. HASELDEN said his reason for finally exhausting the residue from the displacement process with water, was, that he had used water previously for displacing the tincture. The tincture made by displacement had rather a higher specific gravity than that made by maceration.

Mr. TUPHOLME remarked that this increased specific gravity of the tincture made by displacement might be due to the admixture of some of the water used for displacing the tincture.*

TUBULAR CONDENSER.

A SMALL tubular condenser was submitted to the meeting by Mr. Thomas Keates, of 14, Chatham Place, Blackfriars, as a form of condenser well suited for some pharmaceutical operations. Mr. Keates states that he has used this form of condenser for some years, and has found it very efficient and easily cleaned. He claims for it the following advantages:—



First—Its effectiveness combined with portability.

Secondly—In consequence of the steam or vapour being received in an upper chamber it does not enter the tubes until a slight degree of tension is produced; the pressure being thus equalized, the volume of vapour is broken up into as many small portions as there are tubes, and the vapour is forced into uniform contact with the condensing surfaces.

Thirdly—As the condensing tubes are vertical, the condensed vapour runs down their sides equally instead of taking one invariable course as in the common worm; this is often of importance, as it happens that fluids containing organic acids (as spirit of turpentine, which is accompanied by acetic acid) dissolve the copper in the course which they follow through the

* In consequence of this remark, Mr. Haselden has since made the tincture by displacement, using proof spirit instead of water for displacing the tincture, and he states that "the product has a specific gravity coinciding with that of the tincture prepared by maceration."

worm, so that the bottom part, or run, of the worm, as it is called, soon becomes very thin, and after a while, corroded through.

Fourthly—The condensing tubes being comparatively short and straight, they can be easily cleaned. I have found this a very great advantage in condensing the thick viscid oils obtained in the destructive distillation of coals and substances of a similar nature. If a common worm be employed for this purpose it is extremely difficult to keep it clear; but no such difficulty occurs with the tubular condenser.

Fifthly—It is easier to obtain the whole of the products when a condenser of this kind is employed, as thick liquids run down the sides of the vertical tubes more readily and more completely than along the simply inclined surface of the worm.

Lastly—This form of condenser occupies far less space than the ordinary worm. One eight inches in diameter and about three feet long containing twelve or fourteen tubes, half an inch in diameter, would be sufficient to condense the steam from a twelve or fifteen gallon still.

Mr. D. Hanbury drew attention to the

TWO REMARKABLE INDIAN *FUNGI*,

presented to the Society by Dr. Waring, of Travancore, from whose letter accompanying them he read an extract to the following effect:—

Puttu-manga is the Tamil name of a black fungoid substance, of which the following account was communicated to Dr. Waring by Mr. La Bouchardière:—"Three weeks since I had occasion to open the floor of the centre room of my house, for the purpose of building two walls, and on digging to the depth of three feet below the surface, I found several holes scooped out in the earth, perfectly smooth and circular, of sufficient size to admit a man's hand. Hanging down from the sides of these holes were clusters of four, five, six, or ten of the accompanying fruits, of various sizes and shapes. On showing them to the native physicians, they eagerly took possession of the greater number, calling them by the name *Puttu-manga*, and stating that they were found, though but rarely, under the foundations of old buildings, and that they were formed or produced by the white ants. They likewise stated that they were used for medicinal purposes in cases of fever, asthma, bowel complaints, and for worms in children."

Dr. Waring adds that he found upon further inquiry, that great value is attached by the native doctors to this fungus, not that they regard it as a fungus, for in that case no orthodox Hindoo would take it.

The second fungus presented to the Society by Dr. Waring, is thus referred to in his letter:—

"*Carom-pallagum*, a curious coral-like substance, apparently a bulb, dug from the chalk beds on the mountains which separate Travancore from Tinnevelly. The hill people, who bring it occasionally into Trevandrum for sale, state that it is the root of a small plant with a red flower. It is much esteemed by the native doctors of Travancore, who assure me that it acts powerfully in increasing the secretion of urine, for which purpose it is dried, powdered, and mixed with honey, and given in doses of from one to four drachms daily. It is principally employed in turbid urine with a heavy white deposit. It is not procurable in the bazaars."

Mr. Hanbury added that the substances above described, which proved to be both *Fungi*, had been examined by the Rev. M. J. Berkeley and Mr. F. Currey, and that that called *Puttu-manga* had been named by them *Sclerotium stipitatum*,

and an account of it laid before the Linnean Society, May 3, 1860.* The second, called *Carom-pallagum*, appeared to Mr. Berkeley to be identical with the *Mylitta lapidescens* of Horaninow (*Catalogus Medicamentorum Sinensium*, Petropoli, 1856, p. 34), a remarkable body of almost stony hardness brought from China. No trace of fructification has yet been discovered in either species.

SAFETY LABELS.

The President laid before the meeting some new labels which were proposed as a means of preventing accidents in the use of strong or poisonous medicines. The words "Poison," "Not to be taken," or, "For outward application only," were printed in distinct capital letters, white on a black ground, and the letters were raised, or embossed, so that they could be distinguished in the dark by the sense of touch.

PHARMACEUTICAL SOCIETY, EDINBURGH.

The last Scientific Meeting for the present Session was held in George Street Hall on Tuesday evening, 16th current, at nine o'clock;

MR. YOUNG, PRESIDENT, IN THE CHAIR.

Dr. Murray Thomson, F.C.S., was introduced by the President, and read the following paper:—

IMPROVEMENTS IN THE PROCESSES FOR THE PREPARATION OF HYDRIODATE OF AMMONIA AND VERATRIA.

BY MURRAY THOMSON, M.D., F.C.S.,
Lecturer on Chemistry, Edinburgh.

Hydriodate of Ammonia.

There are at present two methods in use for the preparation of this salt. One of these is the same as that given in the Edinburgh Pharmacopœia for the preparation of iodide of potassium, only that the iodide of iron, which is first made, is decomposed by ammonia or carbonate of ammonia, instead of by carbonate of potass. By separating with a filter the insoluble oxide or carbonate of iron, the hydriodate of ammonia is obtained in solution, which it is now only necessary to evaporate, at not too high a temperature, so as to obtain the salt. The other method is to make first a solution of hydriodic acid, by passing sulphuretted hydrogen gas into iodine suspended in water. Hydriodic acid is thus formed, and sulphur precipitated; the latter is separated by filtration, and the acid filtrate is neutralized with ammonia or carbonate of ammonia, and then evaporated to dryness as before.

In either of these ways the salt may be made quite pure, at least so far as obtaining a solution of it is concerned. It is in the evaporation of this, so as to get the dry salt, that the difficulty lies in, obtaining it quite colourless. Almost invariably as the drying of the salt is just being finished, a slight decomposition takes place, and some of the iodine is set free, and communicates its brown colour to the whole mass. To obviate this tendency to decomposition is the purpose of my improvement, and it consists in the first place in taking care that the salt during the time of its being dried, shall always contain a slight excess of ammonia; and, secondly, in re-converting the liberated iodine into hydriodic acid, by from time to time allowing a small amount of sulphuretted hydrogen gas to flow over the salt while it is being dried, an apparatus to evolve the gas being kept at hand during the operation. The effect of adding the gas is, that the brown salt almost immediately becomes white. As soon as this bleaching, so to speak, is effected, the stream of gas is withdrawn and the drying continued, and only resumed if iodine should be liberated a second time. If the salt is well prepared at first, it seldom needs the second application. As soon as the salt is dry, it should, while warm, be put into a dry stoppered bottle, as it is deliquescent. As long as the salt is dry, it

* *Linnean Transactions*, vol. xxiii., p. 91.

will keep a long time colourless, but if it get damp, it is partially decomposed and again gets brown, but its colourless condition may again be restored by a repetition of the above treatment.

It must be admitted that an infinitesimal amount of sulphur finds its way in among the salt, by the use of the sulphuretted hydrogen gas as a decolorizer; in fact, whatever quantity of that gas is actually consumed, has its sulphur precipitated into the hydriodate. To show, however, that this is really no drawback to the use of the gas, I may mention that an exceedingly small amount of free iodine is enough to communicate a considerable depth of colour to a comparatively large amount of the hydriodate. Now, it is to yield hydrogen to this iodine that the sulphuretted hydrogen gas is employed. The greater part of the gas is, however, dissipated as such, and the quantity of sulphur, therefore, is necessarily small in quantity; in fact, it is so minute, that I have not been able to detect its presence in the samples I have prepared by this process, although I employed our most delicate tests for sulphur. I beg, therefore, to recommend the above process for adoption in the preparation of hydriodate of ammonia, a salt which most will agree is far from being easily obtained in a colourless condition.

Preparation of Veratria.

In all the processes as yet published for the extraction of veratria from the cevadilla seeds, which contain it in largest amount, as those given by the London and Edinburgh Pharmacopœias, as also the one given by Wittstein (*Repertoire für der Pharmacie*), alcohol is the agent employed in the very first treatment of the seeds, so as to dissolve out the alkaloid.

I propose to substitute for the use of spirit at this stage, that of boiling water acidulated with hydrochloric acid, proceeding as follows:—The cevadilla seeds are denuded of their capsules by the method recommended in the Edinburgh Pharmacopœia. Any convenient quantity of them is covered with the boiling acidulated water, which is allowed to act on the seeds for twenty-four hours. The liquor is then strained and poured out, and the residual seeds again treated with hot acidulated water as before, such treatment being repeated six or eight times. The accumulated liquors from these operations are now evaporated to about one-twentieth of their total bulk. Ammonia is now added until no more precipitate is thrown down. This precipitate of impure veratria is now separated by a filter, washed, and then dried on the water bath. It is now reduced to powder and treated several times with hot alcohol, which will dissolve out the veratria and very little else. The use of alcohol here is not, however, essential, as the alkaloid might again be extracted by acidulated water; but on the whole it seems better to use spirit at this stage, as the veratria dissolves out comparatively free from impurities. It should also be remembered that the quantity of spirit needed to dissolve out all the veratria contained in this precipitate, is far less than what would be needed to extract the same from the mass of seeds it corresponds to. The amount of alcohol used in the latter case is nearly six times that of the former.

After the spirit has dissolved out the whole of the veratria, the solution is distilled, by which much of the spirit is recovered. The half-aqueous half-spirituous residue is now evaporated, so as to expel all the spirit. Acidulated water and a moderate quantity of animal charcoal are now added, and the whole is heated and filtered. More acidulated water is added to the residue, the heating and filtering being again repeated. This should be done five or six times—as long, in fact, as the filtrate will yield a precipitate by ammonia. Ammonia is now added to the collected filtrates, when the veratria is thrown down. It is now separated and dried. As so obtained, it has a pale straw colour. It will be obtained whiter by repeating the treatment with the acidulated water and charcoal.

By this process I have obtained at the rate of twenty grains of the alkaloid from one (avoirdupois) pound of seeds. In one or two more trials of this process, I have no doubt this amount might be somewhat increased.

I may make the following addendum on the subject of veratria, having reference to a test for it. In most chemical manuals which treat of this alkaloid, it is said that it gives with nitric acid a red or crimson colour, and with oil of vitriol also a red, which afterwards becomes yellow. In any of the samples I have either made or seen, I have not been able to get any colour at all with nitric acid, and with sul-

phuric acid the following is what I have observed:—When the veratria and the acid are mixed, no colour at all, or a very feeble one, is at first developed; but in the course of three or four minutes a full blood-red colour is given, and this may last for two or three hours quite unchanged, after which it gradually fades away. The only other substance which is likely to be mistaken for it is, therefore, salicine, but the points of distinction are these: with salicine, the colour given by sulphuric acid is immediate, and is not blood-red, but decidedly purple-red; and then the colour is so permanent as to last over six hours, by which time the colour of the veratria is quite gone.

Mr. AITKEN proposed a vote of thanks to Dr. Thomson for his communication, which was carried by acclamation.

The Convener of the Essay Committee then read the following Report:—

The Council are much pleased to find that three Essays have been sent to the Secretary in connexion with the present Session, being a decided improvement on previous years; and they confidently hope that the efforts now shown by the Associates, and their successful issue, will induce in future a greater number of competitors.

The Committee appointed by the Council to report on the character of the Essays have now respectfully to submit their decision to the Society.

Having carefully perused the Essays referred to, the Committee think two Essays deserve prizes, and the third commendation. Of the first two, the Committee have decided that the one on Percolation, with motto "*The spare moments well employed*," deserves the "President's Prize," because more patient investigation has been shown in connexion with the process of Percolation than in any previous communication on the same subject; although presenting no novelty in its practical application to Pharmacy, yet the care employed to illustrate the process is such as to induce the Committee to recommend the author as the most successful essayist.

The other paper deemed worthy of the second or "Register Fund Prize," is the one having the motto "*Opifer per Orbem*" attached, the subject being on the "Forthcoming National Pharmacopœia."

The Committee think some of the views enunciated by this author are too theoretical ever to be introduced as practical in any Pharmacopœia; but, notwithstanding this, the care bestowed on its production has induced them to award the second prize to him.

The third Essay, with motto "*Medicus*," "On the Diffusion of Gases," is very carelessly written, although the substance, so far as it goes, deserves commendation.

Edinburgh, 16*th April*, 1861. WILLIAM AINSLIE, *Convener*.

The SECRETARY proceeeed to open the sealed envelopes connected with the two Essays the authors of which were to receive prizes, and on doing so found that the President's Prize had been gained by W. A. Sanger, 150, Oxford Street, London; and the second, or Register Fund Prize, by W. M. Clingan, at Messrs. Duncan, Flockhart, & Co., Princes Street, Edinburgh. The third Essay, having the motto "*Medicus*," will be returned by the Secretary, along with sealed envelope unopened, on application at 121, George Street.

Intimation was then made regarding the Annual Meeting on the 23rd current, at which the presence of Country Members was specially requested. The Meeting thereafter adjourned.

Edinburgh, 18*th April*, 1861.

THE ANNUAL MEETING.

The Annual Meeting was held in George Street Hall, on Tuesday evening, 23rd current, at Eight o'clock;

MR. J. R. YOUNG, PRESIDENT, IN THE CHAIR.

The PRESIDENT read the following

VALEDICTORY ADDRESS.

It has been usual that the Chairman for the time being should, at the termination of a session, make a few remarks by way of gathering into a fasciculus, or bundle,

the various objects of interest which have engaged the attention of the Society during its progress; and in prosecution of this plan I may first of all notice that our scientific meetings for the season have numbered five; that they have on the whole been well attended; and that while in former years we have sometimes had difficulties in procuring the needful assistance wherewith to make these meetings interesting, we have this session had at our command more material than we have been able to make use of. While it becomes us, therefore, to be very grateful to those gentlemen who have so kindly favoured us with their contributions, it also encourages us to hope that the circle of our friends being somewhat widened, we may possibly in another session be enabled to increase the number of these meetings.

No doubt, I am satisfied, can exist in the mind of any one as to the value of the lectures and papers, such as those delivered this season by our esteemed friend and honorary member, Dr. Stevenson Macadam, "On the Chemical Biography of a Plant," proving to us that, in a chemical sense, a plant, though occupying in our eyes a very humble position in a world of wonders, is nevertheless a "more wonderful thing than an animal, and that in the endless chain of the circulation of matter it forms an important and indispensable link;" and, again, "On the Chemical Biography of an Animal," with special reference to those animal products employed in Pharmacy; or the amusing and instructive lecture of Dr. Littlejohn, on the various kinds of evidence on which the law relies in cases of poisoning, pointing out very clearly the valuable assistance which an efficient pharmaceutical chemist might be enabled to give in cases of emergency, not only to the suffering patient, but also to the hurriedly called practitioner. The practical remarks of Dr. Murray Thomson, "On improved modes for the preparation of Iodide of Ammonium and Veratria;" the interesting paper of Mr. Mackay, upon "Shell Lac," giving its source, its history, the mode of its preparation, its supposed adulterations, its great commercial importance, and its present peculiar position in the market; the very excellent communication of my friend, Mr. Joseph Turner, "On the Destructive Distillation of Coal in Gas Manufacture," bringing before us its wonderful products, and proving how inexhaustible are the resources of nature, and how wide the field for further chemical investigation. Nor can I pass over unnoticed the very practical paper of our friend Mr. Nicol, "On the manufacture of Pyroxyline for Photographic Purposes," in which he so distinctly brought before the Society the mode of preparation pursued in his own laboratory.

Instruction of the kind thus indicated has a tendency, I believe, to impress itself on one's mind much more deeply than hours of reading will, more especially when, as is the case with most of us, the body has been in a measure exhausted by the labours of the day. I do hope, therefore, that every exertion will be made to keep up these meetings, serviceable as they are alike to old and young.

We have had two meetings for examination during the year, at which various admissions have taken place.

The examiners have been guided in conducting these examinations very much by the plan adopted by the Board in London. The initiatory one, is simply with a view to evidence the fact of the youth having had a fair educational start, so that he may be enabled to make such progress during his apprenticeship as to pass the minor examination at its conclusion, and thereafter have a little breathing time to make the needful preparation for the more important major.

The Society, in this matter, has acted on a right principle from its commencement. It insists on no rigid curriculum, but aware that its members are scattered over the whole country, and that the opportunities for attending courses of lectures are not equally within reach of all, it says — and says rightly to those who desire admission—it is expected that when you present yourselves for examination, you shall have an accurate acquaintance with certain subjects. We care not how that knowledge has been obtained. Whether from lectures or from books, or from both, it matters not to us, but have it you must, or there is no entrance here. The object in advising you to connect yourselves with this Society, is not that we may have your wealth, but it is that you should devote yourselves with us to the study of those subjects which are essential to make us careful, trustworthy Chemists, that

thus the public may ultimately be enabled to mark the difference between having their wants supplied by any one who, from a desire to puff some nostrum or other motive, can, in the language of Prof. Christison, "buy a few pots and bottles, and rent a shop," and an individual who, with a liberal education, and a well-stored mind, makes the quality of his articles a matter of conscience, has a thorough acquaintance with the substances in which he trades, and, with his profession, in all its details.

It has been very pleasing to me that the prizes annually offered by the Society have this year been contested for, and, as was fully announced in the report of the Prize Committee, the essays were of such a kind as warranted the Committee in awarding the prizes at our last scientific meeting.

I am not aware that during the past year any additions of importance have been made to our already large list of medicines. Syrups of various kinds and hues, red, brown, and grey, are being largely prescribed. Glycerine combined and uncombined maintains its reputation. The tendency of the age is combination, so that one's brains are puzzled in attempting to keep pace with the varied progeny. Let us hope that with the new Pharmacopœia there will be fewer of this motley group, so that the medical profession may have less occasion than now to complain of want of uniformity. Actæa, or bugbane, has been introduced into this country by Professor Simpson, as a remedy in rheumatism ; and it is said that the professor in his own person has derived benefit from its use. A very full account of it by Professor Bentley will be found in the March number of the Journal ; and in the February number there is a notice by Mr. Daniel Hanbury of a new drug from Mexico with a most unpronounceable name, but which, if it possesses the properties alleged in its favour in the published extract from the German journal, will be hailed as something equivalent to the discovery of the philosopher's stone.

I know not that I have anything else now to do than to express my grateful thanks for the uniform kindness and courtesy which I have received while discharging the duties of the chair. On this I calculated on accepting office, and I am proud to think I have not been disappointed. My only sources of regret have been that I have been able to do so little, and that our efficient Secretary has had to do so much. If one thing more than another has pressed itself on my mind during the past session, it has been the amount of labour which, in connexion with this Society, is imposed on Mr. Mackay. Surely it cannot be contemplated that this state of things is to last for ever. The Society has now passed the morning of its youth, and its resources are not now so limited that it should altogether "muzzle the ox that treadeth out the corn." We seek not to dictate to our brethren of the Council in London; but holding ourselves part and parcel of the Society, we ask, is it a right and proper thing that such an amount of labour (much of it mere manual) should be thrown on any individual for such a long period of time, and not even allowance made for the salary of a clerk ?

The Secretary was then called upon to read

THE ANNUAL REPORT.

The Council have as usual shortly to bring before the notice of this meeting the proceedings of the Society in Edinburgh during the year 1860.

The Session which has so recently closed will speak for itself. The Scientific Meetings have been five in number—were numerously attended—while the various subjects there introduced possessed considerable interest. The Council take this opportunity of thanking all those gentlemen who contributed papers throughout the winter. It is most desirable that at least five or six of these meetings should take place during every Session, and the Council hope that Members will make an effort to enable them to carry out such an arrangement for the future.

It is matter of regret that so few in Scotland have joined the ranks of the Pharmaceutical Society during the past year, but the Council are still in hopes that ere long some modification may be made by the Board in London regarding the present system of paying so large a sum of entry money at one time, as will enable some who are thus deterred from joining the association to come forward, and to numerically increase the strength of the Society.

The Museum still progresses, but more slowly than desirable; and the Council

feel that this department cannot be too strongly commended to the notice and support of both Members and Associates, as a series of specimens illustrative of Materia Medica, Pharmacy, and Chemistry, cannot be too highly appreciated by the more advanced as well as by the younger Pharmaceutist. This opportunity is also taken to thank the Curators, and likewise all those who have contributed to the shelves in the museum room.

The Library has had several very valuable additions made during the last year, and it affords much gratification to the Council to know, that, upon the whole, more books have been applied for throughout this Session than during any previous one. Steady additions will continue to be made in the hope that Associates and Apprentices, as well as Members, will avail themselves of the privilege of getting out for perusal such books as they may desire. Catalogues will be furnished on application to the Curators.

Essay writing has received more attention than usual, and the Council have both pleasure and satisfaction in stating, that the first prize essay on Percolation is one of considerable merit, and bears undoubted evidence of much patient investigation on the part of the author, in connexion with this interesting and important operation.

The following is an account of the Secretary's intromissions from 1st January to 31st December, 1860:—

Secretary in Account with Pharmaceutical Society, from 1st January to 31st December, 1860.

Dr.

1860.		£	s.	d.
Aug. 20.	Cash sent from London	50	0	0
Dec. 31.	Balance due Secretary...	14	2	8
		£64	2	8

Cr.

1860.		£	s.	d.
	Paid Rent of Rooms.....	25	0	0
	Attendance at door of Meetings, Delivering Billets, and Cleaning Rooms.....	3	0	0
	Advertising	0	15	0
	Expenses at Annual Meeting.....	2	1	4
	Insurance	0	7	6
	Postages.....	1	13	7
	Expenses of Scientific Meetings	5	15	0
	Books for Library	11	12	0
	Museum.....	7	5	6
	Printing.....	6	3	0
	Envelopes, Paper, &c. &c.	0	9	9
		£64	2	8
Dec. 31,	Due Secretary.....	£14	2	8

We, the undersigned, have examined the foregoing accounts, with vouchers attached, find them correctly stated and entered, and the balance due to the Secretary at 31st December, 1860, fourteen pounds two shillings and eightpence sterling.

J. R. Young.
Wm. Ainslie.
William Aitken.

Edinburgh 20th April, 1861.

There appears every probability that the National Pharmacopœia will be published by the end of the present year, and that before our next annual meeting it will have taken a place on the desks of most Pharmaceutical Chemists. It may be premature thus to refer to this expected production, but the Council do not doubt, judging from the well-known character and ability of those engaged in its compilation, that, when ready for circulation, the work itself will be a great boon, while the introduction of new, and the alteration and improvement of old, formulæ, will doubtless enhance its value to all Dispensing Chemists.

In closing this Report, the Council cannot refrain from adverting to the recent loss sustained by the Society in the death of their worthy and highly esteemed fellow-member, Mr. J. F. Macfarlan. Long connected with the Society, and indeed associated with it from its very commencement, he showed a warm interest in its success ; while with a rare ability and ready willingness, he most heartily gave his assistance in carrying forward everything connected with increased pharmaceutical

education; and they cannot, therefore, but give an expression of sincere regret at his departure from among them.

Mr. G. Blanshard moved the adoption of the Report, which was carried unanimously.

The Chairman proposed Mr. Ainslie as President, and Mr. Aitken as Vice-President for the year 1861-62.

Mr. Robertson seconded this, which was carried with acclamation.

Mr. Murdoch, of Falkirk, proposed the following gentlemen as Members of Council:—President and Vice-President, Messrs. Geo. Blanshard, D. R. Brown, Cooley, Flockhart, Gardner, Gray, Kemp (Portobello), Hart (Glasgow), Lindsay, Raimes, Stephenson, and Young.

Mr. Wm. Baildon seconded the motion, which was carried.

Mr. Anderson, of Musselburgh, moved that the following be recommended as Examiners:—The President and Vice-President, and Messrs. D. R. Brown, Flockhart, Gardner, Kemp, Robertson, Tait, President and Vice-President in London, and Secretary in Edinburgh *ex officio*.

Mr. Conacher, of Mackinch, seconded this, which was carried unanimously.

Mr. Geo. Blanshard suggested that Mr. John Mackay be recommended as the Council representative at the London Board, in room of the late Mr. Macfarlan.

Mr. Kemp, of Portobello, moved that Messrs. Ainslie, Stephenson, and Young, be Curators of Museum and Library.

Mr. Robertson seconded this, which was carried.

Mr. Young proposed that Mr. John Mackay be requested to continue his services as Secretary. Seconded by Mr. Murdoch, and carried with acclamation.

The meeting therefore adjourned to meet at supper.

THE ANNUAL SUPPER

was held in the Café Royal, Register Street, at half-past nine o'clock the same evening.

Mr. Ainslie acted as Chairman, and Messrs. Aitken and Raimes as Croupiers.

There was a large attendance, between eighty and ninety being present. The Chairman intimated several apologies, and the following toasts were given:—The usual loyal toasts by the Chairman, which were most heartily responded to; "The Town Council of Edinburgh," by D. S. Macadam, responded to by Dr. Alexander; "The Pharmaceutical Society," by the Chairman; "The Royal College of Physicians and Surgeons," by Mr. Aitken; "The Memory of Jacob Bell," by Mr. John Mackay; "The President and Council in London," by Mr. Robertson, acknowledged by Mr. Mackay; "The Honorary Members in Scotland," by Mr. D. R. Brown, responded to by Dr. S. Macadam; "The Associates and Apprentices," by Mr. Raimes; "The Retiring President," by Mr. G. Blanshard, acknowledged by Mr. Young; "Mr. Kemp, of Portobello, and the Country Members," by Mr. Young, replied to by Mr. Kemp; "The Board of Examiners and Council in Edinburgh," replied to by Dr. Macadam; "The Strangers present," by Mr. Stephenson, acknowledged by Mr. Scott, of London; "The Memory of Mr. J. F. Macfarlan;" "The Chairman," by Mr. Brown; "The Croupiers," by Mr. Raimes; "The Secretary" by Mr. Young.

ORIGINAL AND EXTRACTED ARTICLES.

NOTES ON CHINESE MATERIA MEDICA.

BY DANIEL HANBURY, F.L.S.

(*Continued from page* 116.)

FRUITS AND SEEDS.

花椒 *Hwa-tseaou;* Fruits of *Zanthoxylum* (*Rutaceæ*, tribe *Zanthoxyleæ*); *Hoa-tsiao*, Guibourt, *Hist. des drog.*, T. iij., p. 514.—*Japanese Pepper*, Sten-

house, *Phil. Mag.*, 4 series, vol. vii. (1854), p. 23; *Pharm. Journ. and Trans.*, vol. xvii., p. 19; *Pun-tsaou*, fig. 685.

Hwa-tseaou is a name applied to the fruits of two species of *Zanthoxylum*, namely, *Z. piperitum*, D. C., and *Z. alatum*, Roxb.* The first is a native of Japan, in which country its fruits are used as a condiment; the second is indigenous to India and China, and, as proved by specimens obtained by my brother, Thomas Hanbury, of Shanghai, is the source of the *Hwa-tseaou* of the Chinese shops.

Zanthoxylum alatum, first noticed by Capt. Hardwicke, in 1796,† is a small tree occurring in various parts of Northern India, as in Oude, Rohilcund, Kumaon, Nepaul, Sikkim, Bhotan, and Khasia, and extending far eastward into China. As may be expected from so extensive a range, it varies considerably, especially as to the size of its leaves and number of its leaflets, and the number and size of its spines; but the transition from one form to another is so gradual that no botanist who should examine a large series of specimens could doubt their belonging to a single type.

Fig. 1.

The fruits (fig. 1), as found in the Chinese shops, consist of the carpels usually dehiscing and empty, but sometimes enclosing the round, black, shining seed. In perfect specimens we find a slender pedicel supporting the carpels, which are normally four in number, but of which at least one or two are mostly abortive. The carpels are oval or nearly spherical, $\frac{2}{10}$ths of an inch in longest dimension; externally they are of a bright reddish brown, covered with prominent tubercles filled with oleo-resin; internally they are furnished with a hard, papery, white membrane, which becomes loose, contracts and curls up when the seed falls. The drug has a peculiar aromatic taste, and, when crushed, an agreeable and highly aromatic odour—properties due to the oleo-resin contained in the outer part of the carpel.

The fruits of *Zanthoxylum alatum*, Roxb.,‡ have been subjected to chemical analysis by Dr. Stenhouse, who has obtained from them by distillation:—

1. An essential oil, to which the aromatic properties are chiefly due. This oil, which when pure is called by Dr Stenhouse *Xanthoxylene*, is a hydrocarbon isomeric with oil of turpentine. It is colourless, refracts light strongly, and has an agreeable aromatic odour; its composition is C_{10} H_8.

2. *Xanthoxylin*, a stearopten found floating on the water, distilled from the seeds, and also separable from the crude essential oil.

After repeated crystallizations from alcohol, xanthoxylin may be obtained in a state of purity, and then presents the form of large crystals of a fine silky lustre, insoluble in water, but readily soluble in alcohol or ether. It has a very slight odour of stearine, and a slightly aromatic taste. It distils unchanged, its fusing point before and after distillation remaining the same, namely 176° F., and its solidifying point 172.4° F. Its composition is C_{40} H_6 O_4.

The fruits of *Zanthoxylum alatum* are used in China as well as in India as a

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* I retain Roxburgh's name for this plant, because I am certain of its identity. Steudel supersedes it by that of *Z. acanthopodium*, D. C.; but this latter is not identical, at least according to M. Alphonse de Candolle, who, at my request, has kindly compared it with specimens of *Z. alatum*, Roxb., from China.

† *Asiatick Researches*, vol. vi., p. 376.

‡ Erroneously supposed at the time to be those of *Z. piperitum* D. C.

condiment. The *Fagara* or *Fagara minor* of the old pharmacologists* is probably referrible to this species.

白蒺藜 *Pih-tseih-le;* Carpels of *Tribulus terrestris*, L. (*Zygophylleæ*); *Pĕ ciĕ lî*, Cleyer, *Med. simp.*, No. 28; *Pun-tsaou*, fig. 322.—These little spiny carpels have slightly astringent properties. Loureiro states that they are beneficial in *hæmorrhagia narium* and in dysentery; also as the basis of a gargle in tenderness of the gums, and in ulcers and inflammation of the mouth and throat.

The herb was formerly officinal in Europe, but is now obsolete.

巴豆 *Pa-tow;* Fruits of *Croton Tiglium*, Lam. (*Euphorbiaceæ*); *Pā teú*, Cleyer, *Med. simp.*, No. 224.

The seeds, from their drastic purgative properties, are regarded by the Chinese as extremely poisonous.

呂松菓 *Leu-sung-kwo;* Seeds of *Strychnos Ignatia*, Juss. (*Loganiaceæ*); Saint Ignatius Beans.—These well-known seeds are imported from the Philippines, in the Bisayas provinces of which islands, the tree which affords them is stated by Blanco, the author of the *Flora de Filipinas*, to be common. But neither this botanist nor any other has been able, that I am aware of, to procure complete specimens of the tree, so that it is as yet undescribed.

木鱉子 *Muh-pëĕ-tsze*, also called *Fan-muh-pëĕ;* Seeds of *Muricia Cochinchinensis*, Lour. (*Cucurbitaceæ*); *Pun-tsaou*, fig. 387 and 386; *Mŏ piĕ cù*, No. 188, Cleyer.—Orbicular or obscurely triangular compressed seeds (fig. 2), tubercled at the margin, and having a dark brown, fragile, rugose testa, frequently marked with depressed reticulations; in diameter they vary from $\frac{3}{4}$ to $1\frac{1}{4}$-inches. The yellow cotyledons within are extremely oily.

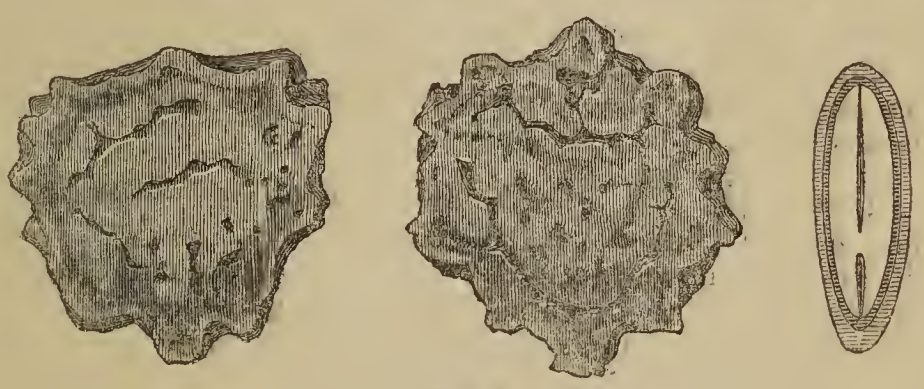

Fig. 2.

According to Loureiro, the seeds and leaves of *Muricia Cochinchinensis* are aperient, and useful in the treatment of tumours and malignant ulcers, and of obstructions of the liver and spleen. The plant is a native of China and Cochin China; it is not enumerated in the Flora of Hong Kong,† and, I believe, has not been obtained by any collector in recent times. There is an indifferent specimen of Loureiro's in the British Museum.

决明子 *Keuĕ-ming-tsze;* **草决明** *Tsaou-keuĕ-ming;* Seeds of *Cassia Tora*, L. (*Leguminosæ*).—Tatarinov, *Catal. Med. Sinens*, p. 5; Ainslie, *Mat. Indica*, vol. ii., p. 405.

Seeds of a cylindrical form, 2 to 3 lines long, pointed at one extremity, rounded at the other, of a dark brown colour with two light stripes on opposite sides.

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* *Vide* Dale, *Pharmacologiæ Suppl.*, Lond., 1705, p. 298; also Chabræus, *Stirpium Sciagraphia*, Genev., 1677, p. 26.

† Bentham, *Flora Hongkongensis*, Lond., 1861, 8vo.

石栗 *Shĭh-leĭh;* Seeds of *Aleurites triloba*, Forst. (*Euphorbiaceæ*); *Juglans Camirium*, Loureiro.—The kernel of the seed yields abundance of oil.

楮實子 *Choo-shĭh-tsze;* The small seed-like nuts or achenes of *Broussonetia papyrifera*, Vent. (*Moreæ*), Paper Mulberry Tree.

These are roundish seed-like bodies somewhat smaller than the seeds of white mustard, slightly compressed and keeled on one side, of a pale brown, or, when fresh, orange colour. The fleshy part of the compound fruit is saccharine and edible; what virtues the seeds are supposed to possess, I do not know. The inner bark of the tree is used in Japan for the manufacture of paper, as is fully described by Kæmpfer.*

使君子 *She-keun-tsze;* Fruit of *Quisqualis indica*, L. (*Combretaceæ*); *Pun-tsaou*, fig. 385.

These fruits (fig. 3) are about an inch in length, oval or oblong, pointed at either extremity, and sharply pentagonal. The woody pericarp is thin, fragile, and of a deep mahogany colour, and encloses an oily seed. Loureiro states that the seeds used daily are recommended as an anthelmintic and in the rachitis of children.† Their anthelmintic properties, though recorded by Rumphius and several subsequent writers besides Loureiro, have not attracted much attention in Europe. Recently, however, Dr. E. J. Waring, of Travancore, has published a paper on some of the principal indigenous anthelmintics of India, in which he has quoted some favourable reports of the properties of the seeds in question.‡ From these it appears that the seeds are chiefly used against *lumbrici*, especially when occurring in children. They are sometimes given almost *ad libitum*, but generally the dose of four or five good seeds is found to be sufficient.

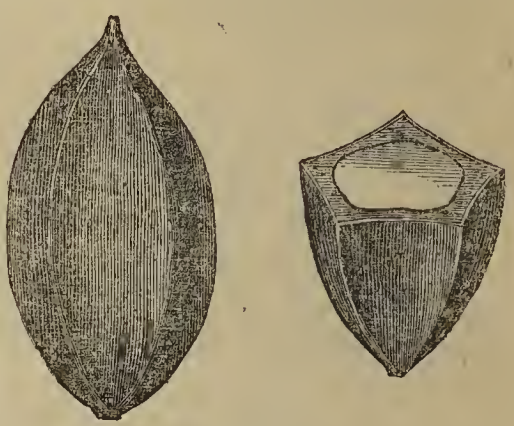

Fig. 3.

訶子 *Ho-tsze;* 柯勒黎 *Ko-lih-le;* Fruits of *? Terminalia Chebula* Roxb. (*Combretaceæ*); Chebulic Myrobalans.

These fruits are well known in English commerce on account of their astringent properties, which render them valuable in various processes of dyeing. In medicine they have been held in esteem for ages, not only on account of their astringency, but also from their mildly purgative properties. Hill remarks that when given in substance they do not exert their purgative faculty at all, but are astringent only, whereas when administered in infusion or decoction they open the bowels in a very gentle and easy manner.§ In China, Europeans, I am informed, occasionally have recourse to myrobalans as an aperient—at the instance, I suppose, of native practitioners. The dose is from 2 to 4 drachms in infusion.

蒼耳子 *Tsang-urh-tsze;* Fruits of *Xanthium strumarium*, L. (*Compositæ.*) Bentham, *Flor. Hongkong*, p. 181; *Pun-tsaou*, fig. 252; *Çam 'lh çù*, Cleyer, *Med. Simp.*, No. 114; Kæmpf. *Amœn.*, p. 892.

Xanthium strumarium, an almost ubiquitous weed in temperate and warm

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* *History of Japan* (Scheuchzer's translation), Lond., 1727, Appendix, p. 22.

† *Flor. Cochinch.*, p. 337.

‡ *Indian Annals of Medical Science*, No. 12 (1860).

§ *History of the Mat. Med.* Lond., 1751. 4to, p. 503. Myrobalans were included in the *Materia Medica* of the London Pharmacopœia down to the year 1721.

climates, is found both in China and Japan. Its leaves, under the name of *Herba Lappæ minoris*, were formerly officinal in Europe, and were administered internally in scrofula, herpes, &c., and externally as an application to scrofulous tumours.*

蛇床子 *Shay-chwang-tsze;* Fruits of *Cnidium Monnieri*, Cusson (*Umbelliferæ*).—*Xĕ choâm çù*, Cleyer, *Med. Simp.*, No. 37; *Pun-tsaou*, fig. 157.

Minute ovoid umbelliferous fruits; mericarps, with very prominent equal ribs, one vitta between each; commissure bi-vittate.

Cnidium Monnieri has been found by the Russian botanists in inundated spots on some of the islands of the Amoor, where, however, it does not appear to be a common plant.† As the seeds seem to be an object of commerce, the plant is probably more frequent in some district of Northern China.

榧實 *Fe-shĭh;* Seeds of *Torreya nucifera*, S. et Z. (*Taxineæ*); *Taxus nucifera*, L.; *Podocarpus nucifer*, Loud.—*Fey-tsy*, Tatarinov, *Catal. Med. Sin.*, p. 23; *Fi vulgò Kaja*, Kæmpf. *Amœn*, p. 814, fig. p. 815; *Pun-tsaou*, fig. 672.

From 1 to 1½ inches long, ovoid or oblong, cylindrical, pointed at the upper extremity, less so at the lower. The testa is of a cinnamon-brown colour, woody and fragile, marked longitudinally with broad, shallow striæ, and having a smooth scar at the base, near to which, and opposite each other are two small oblong prominences. The nucleus, which is deeply corrugated, is covered by a thin brown membrane; its base is marked by a conspicuous cicatrix.

The seeds of *Torreya nucifera* are eaten like hazel nuts, and although reputed somewhat laxative, are considered wholesome. In Japan an oil is expressed from them, which is used for culinary purposes.

白菓 *Pih-kwo;* 銀杏 *Yin-hăng* (*Silver-almond*); Seeds of *Salisburia adiantifolia*, Sm. (*Taxineæ*).—*Gingko biloba*, L.; Gingko, arbor nucifera folio adiantino, Kæmpf. *Amœn*, p. 811; *Pun-tsaou*, fig. 658.

These are nut-like, oval, pointed seeds, from ½ an inch to an inch long, keeled lengthwise on two sides, and having a smooth, fragile, bony, pale brown, outer shell, or testa. The nucleus of the seed consists of amylaceous albumen enclosing a pair of long, narrow cotyledons, the whole enveloped in a delicate reddish-brown membrane.

Salisburia adiantifolia is commonly cultivated both in China and Japan, where it attains a large size. The male plant was introduced into Europe about a century and a half ago; the female much more recently. The tree is not uncommon in gardens; and in the warmer parts of the Continent it ripens its handsome, plum-like, yellow fruits perfectly. The seeds, Kæmpfer tells us, are eaten to promote digestion "ac tumentem ex cibo ventrem laxare!" The pulp, which has a penetrating offensive smell of butyric acid, has been chemically examined by Dr. Schwarzenbach,‡ who has extracted from it by means of ether a peculiar crystallizable fatty acid, which has been named *Gingkoïc acid*, and which has the composition $C_{48}\ H_{47}\ O_3 + HO$. Gingkoïc acid forms tufts of acicular crystals, which have not been obtained colourless, but are of a brownish-yellow; it is easily soluble in alcohol or ether, and exhibits in either case a strong acid reaction. It fuses at 95° F., and congeals at 50°. Heated with solution of potash, it formed a soap-like compound. The other constituents of the pulp are pectin, gum, glucose, citric acid, and chlorophyll.

(*To be continued.*)

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* Murray, *App. Medicam.*, vol. i. (1793), p. 212; Geiger, *Pharm. Univers.* (1835), i., p. 128.
† Maximowicz, *Primitiæ Florœ Amurensis* (1859), p. 126.
‡ *Vierteljahresschrift für Praktische Pharmacie*, Bd. vi., 424.

ON THE COLOUR-TESTS FOR STRYCHNIA, AND THE DIAGNOSIS OF THE ALKALOIDS.

Being the substance of part of the Croonian Lectures for 1861, *delivered at the Royal College of Physicians.*

BY WILLIAM A. GUY, M.B., CANTAB.,
Fellow of the College, and Professor of Forensic Medicine, King's College, London.

The observations which I am about to make on the colour-tests for strychnia formed part of the three Croonian Lectures on Tabular Analysis, given at the College of Physicians at the end of February and beginning of March of this year. In those lectures, one form of tabular analysis was illustrated by a table of the alkaloids, and as the construction of the table grew out of a series of experiments on strychnia, and especially on the colour-tests for that important poison, it was necessary to enter into some details respecting those tests. The questions which I proposed to myself for solution were the following:—

1. The best form and mode of application of the colour-tests.
2. Of the colour-tests, which is to be preferred?
3. Are the colour-tests, or is the selected test, open to any serious objection?
4. Is it possible by means of the colour-tests, or by any simple modification of them, to distinguish the alkaloids from each other?

Before I proceed to discuss these questions, I must premise that most of the specimens of strychnia and of the other alkaloids on which I experimented were supplied to me by the Messrs. Morson. The majority of them were presented to me by them as specimens of approved purity; the remainder were procured from them from time to time. For a few specimens I was indebted to my colleague, Professor Bentley. Several of the alkaloids in Mr. Morson's series are crystals of large size and great beauty, and the remainder are evidently of the best quality; of some of the more important alkaloids, such as strychnia, brucia, and aconitina, I have more than one specimen. When the results which I obtained did not happen to agree with the descriptions of approved authorities, I made experiments with other specimens, and endeavoured to ascertain the reason of the discrepancy. I may add that the results stated in these papers are based upon several hundreds of experiments carefully performed, and the reactions noted down at the time. In order to guard against any possible misapprehension, it may be well to state that the term "colour-tests" is used throughout these communications in the sense of tests producing a series, or succession, of colours; and that it is further restricted to the chemical colour-tests as distinguished from the galvanic colour-test.

1. *Form and mode of application of the Colour-tests.*—The chemical colour-tests for strychnia consist in the peculiar reactions of the alkaloid with sulphuric acid, *plus* one or other of the following substances:—The bichromate of potash and the ferricyanide of potassium, and the peroxides of manganese and lead. To these may be added, as less generally recognized, the chromate of potash and chromic acid; and it may be well to state that the chromates of soda and ammonia yield characteristic reactions.

To the four recognized colour-tests—the bichromate of potash, the ferricyanide of potassium, the peroxide of manganese, and the peroxide of lead—I propose to add the permanganate of potash.

In order fully to appreciate the action of these tests, it should be borne in mind:—

1. That sulphuric acid, of the strength and degree of purity commonly met with in the shops, when added to, and mixed with ordinary specimens of strychnia, does not produce in them any change of colour.

2. That the acid does not occasion any change of colour in the peroxide of manganese or the peroxide of lead.

3. That the acid when mixed with a fragment of the bichromate of potash, produces a yellow solution, which passes gradually to a yellow-brown and clear orange.

4. That the acid when mixed with a fragment of the ferricyanide of potassium, gives a lemon-yellow solution, becoming tinged with blue after long exposure.

5. That the permanganate of pctash treated in the same way yields with the acid a light green solution, deepening in tint by degrees, then assuming a pink tint at the margin, then, after longer exposure, becoming brown at the centre and lilac at the circumference, and finally, after still longer exposure, presenting a rich scarlet at the centre and a brown at the circumference.

Now, as the succession of colours produced when strychnia, sulphuric acid, and either of the five substances just specified are brought into contact, are entirely different from those occasioned by the action of sulphuric acid on the five substances in question, and as, moreover, the strychnia colours develop themselves very speedily, there is no valid objection to the use of these substances as tests. The yellow tint of the acid solution of the bichromate of potash, the lemon-yellow tint of the acid solution of the ferricyanide of potassium, and the light green tint of the acid solution of the permanganate of potash, offer no impediment to the development of the characteristic strychnia colours, and cannot possibly be confounded with them. The same observation applies equally to the mixture of sulphuric acid with the solutions of these salts. When solutions of the strength of ten grains to the ounce of distilled water are added to equal quantities of strong sulphuric acid, the bichromate of potash yields an orange coloured mixture, the ferricyanide of potassium a lemon-yellow, and the permanganate of potash a red-brown. The tints vary with the quantity of the acid and of the solutions, and they undergo some change on long exposure; but it may be safely alleged that the colours thus produced do not interfere with the production of the characteristic strychnia colours, and that they cannot possibly be confounded with them. But as for medico-legal purposes, it is well to avoid all objections, however captious, the peroxide of manganese, or the peroxide of lead, may claim to be preferred if, on further examination, they should be found to possess other properties entitling them to a preference.

Having shown that strychnia when treated with sulphuric acid undergoes no change of colour, and that the several tests (the peroxide of lead, the peroxide of manganese, the bichromate of potash, the ferricyanide of potassium, and the permanganate of potash) undergo either no change of colour, or such changes only as do not admit of being confounded with the strychnia colours, I proceed to consider in succession, 1. The best way of applying the colour-tests; 2. The best order in which to use the reagents; and 3. The best form in which to apply the colour-developing tests.

1. The colour-tests are best shown on slabs of glass coated with white arsenical enamel by the process technically called "flashing."* But the lids of porcelain crucibles, or white plates, or fragments of any white ware, will answer the purpose very well. If the enamelled glass is used the tests should be applied to the glass-surface. In using the tests scrupulous cleanliness should be observed, and the sulphuric acid and colour-developing tests, if in solution, are best applied by the drop-bottle, as more delicate, and more secure from any soil than the common glass rod. For mixing the several substances together a glass spatula is to be preferred to a glass rod.

2. The order in which the sulphuric acid and the colour-developing tests should be applied is easily determined by one or two simple considerations.

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* I have been in the habit of using this enamelled glass for colour-tests for several years. Oblong slabs of the kind described in the text may be obtained at Powell's Glass Works, Whitefriars.

Good and characteristic results may be obtained by mixing the sulphuric acid with the colour-developing tests, and then adding a crystal of strychnia. When so mixed with small quantities of the peroxides of manganese and lead, the acid solution has a neutral tint, which in no way interferes with the full development of the strychnia colours; and even the acid mixtures of the other colour-developing tests are not open to any fallacy if the alkaloid is brought into contact with them as soon as they are made, and before the colours first produced are deepened or changed by exposure to the air. But the method of procedure which begins with dissolving the alkaloid in the acid and then applying the colour developing tests is to be preferred, inasmuch as the absence of colour in the acid solution is some advantage in itself, as giving full effect to the strychnia colours, while it has the still greater advantage of distinguishing strychnia from several alkaloids (poisonous and non-poisonous), which yield colours with the acid without the addition of the colour-developing substances.

3. The best form in which to apply the colour-tests for strychnia is a subject of considerable practical importance, and it is one upon which there is at present no distinct agreement among Chemists. Some authorities prescribe the application of the colour-developing substances in the solid form, some in solution, and some who prefer the state of solution use strong solutions, while others employ weak ones. The balance of authority is certainly in favour of applying the colour-developing tests in the solid form, and my own experience is favourable to this mode of application. It is also commended by the obvious consideration that solution in water is favourable to a rapid development of the changing colours which constitute the test, such quick change of colour being among the most serious objections to the colour-tests. At any rate it must be admitted to be of the first importance to secure as slow a change of colour as possible, in order to give time for the observation of the colours actually produced.

The superiority of the solid form to the solution is easily shown by a comparative experiment. If we take two minute fragments of bichromate of potash of equal size, place them on a slab of white enamelled glass or porcelain, add to one of the fragments a drop of distilled water, and dissolve it in the water, and leave the other untouched; then place on the slab two equal drops of the same solution of strychnia in sulphuric acid, we shall find that on bringing the fragment of bichromate of potash into contact with the acid solution of strychnia, its colour changes from yellow to blue, and when stirred into the liquid with a glass rod or glass spatula, yields a rich blue solution, which retains this colour long enough for easy and complete identification, and then gradually assumes the other tints to be presently described, retaining the final tint for hours or days. While, on the other hand, the solution of the bichromate of potash, when brought into contact with the acid solution of strychnia, yields a blue colour at the point of contact, which colour quickly disappears on mixing the two liquids with each other. When, therefore, we make use of the colour-developing tests in substance, we obtain highly characteristic and lasting colours, but when we use them in solution, one evanescent colour only. It is true that if to the mixture of the acid solution of strychnia with the watery solution of bichromate of potash, we add a drop or two of strong sulphuric acid, we obtain a blue liquid, which undergoes the characteristic changes of colour; but the important fact remains that, other things being equal, solution in water greatly impairs the delicacy of the colour-tests. If in this comparative experiment we substitute for the bichromate of potash the other soluble colour-developing substances—the ferricyanide of potassium and the permanganate of potash—we obtain the same results.

The injurious effect of dilution with water upon the colour-tests is differently shown in the following comparative experiment:—I placed on a porcelain slab four equal drops of the same solution of strychnia in strong sulphuric acid. To

two of the four drops I added a drop of distilled water, and then to all the drops, diluted and undiluted, equal minute fragments of the bichromate of potash. The undiluted drops gave highly characteristic results—the usual succession of rich strychnia-colours; while the diluted spots gave no indication of the presence of strychnia, but merely a yellow solution. The same comparative experiment gave the same results with the ferricyanide of potassium, the permanganate of potash, and the peroxides of manganese and lead. The ferricyanide gave a lemon-yellow, and the permanganate of potash a pink, solution; while the peroxides of manganese and lead imparted a neutral tint. In multiplying this class of experiments I have now and then obtained a characteristic reaction, and occasionally an evanescent streak of blue; but these were exceptional cases.

The strength of the solution of strychnia in sulphuric acid used in both these series of experiments was one grain in 200 *drops;* and as the same *pipette* was used in preparing the solution and in the experiments, each drop contained the two-hundredth of a grain of strychnia.

Now these experiments, though they cannot be taken to prove that the dilution with water of the acid solution of the alkaloid, or the application of the colour-developing substance in solution, must be fatal to the success of the colour-tests, whatever the quantity of the alkaloid or of the acid, they do certainly demonstrate the great advantage attending the use of the colour-developing substances in the solid state. The experiments, it will be observed, are strictly logical and comparative. The distilled water added to the acid solution of the alkaloid, or to the colour-developing substance, was the only element of variation in the two series of experiments.

That the indistinct, or wholly negative, results obtained when distilled water is added are not due to mere dilution, or increase in the quantity of liquid present, is shown by the following experiment:—I placed five equal drops of the same solution of strychnia in sulphuric acid (1-200th grain in the *drop*) on each of three porcelain slabs. I made no addition to the first drop, but added to the second drop one drop of strong sulphuric acid; to the third, two drops; to the fourth, three drops; and to the fifth, four drops. I then added to each spot on the first slab an equal fragment of bichromate of potash; to each spot on the second slab, an eqnal fragment of peroxide of manganese; and to each spot on the third slab, an equal fragment of the permanganate of potash. The reactions were perfect and characteristic in each case, the colours differing only in depth of tint, but not in proportion to the degree of dilution. The peroxide of manganese was remarkable for the duration of the colours, and the permanganate of potash for their brilliancy.

Having now, as I believe, shown the superiority of the colour-developing tests in substance to the same tests in solution, and demonstrated the disadvantage of introducing into the colour-tests the element of dilution with water, I shall reserve for another communication the question of the effect of the quantity of the colour-developing substances on the success of the colour-tests, as well as the answer to the three remaining questions.

(*To be continued.*)

NEW FORM OF BURETTE.

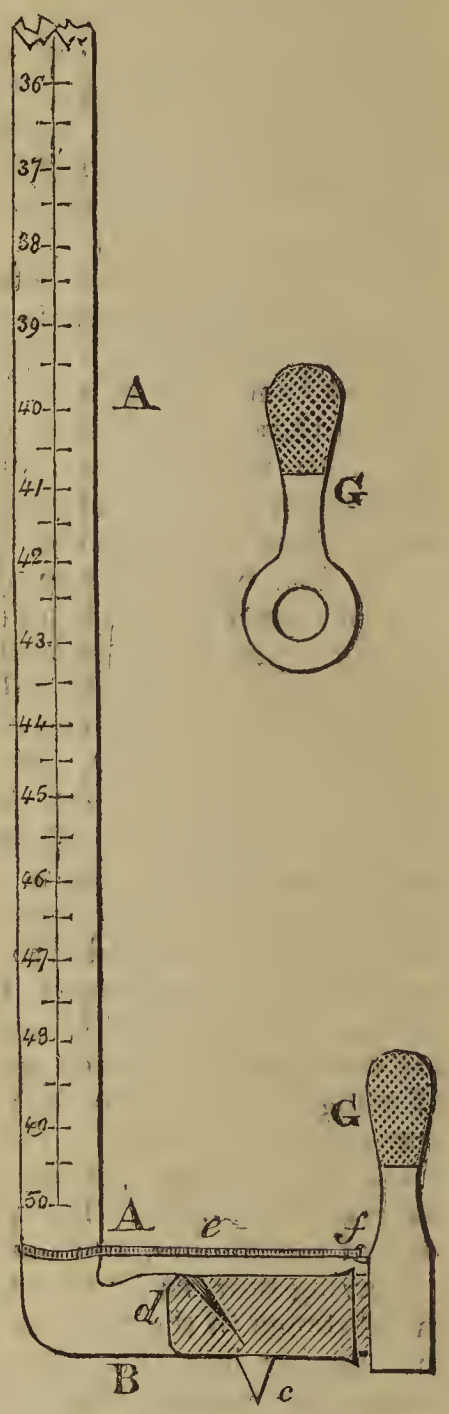
BY MR. JOHN T. MILLER.

The excellence of Mohr's burette is generally admitted, but as the india-rubber of the compression stop-cock does not withstand the action of solution of permanganate of potash, the analyst is obliged to use some other instrument when working with that fluid.

Gay-Lussac's and Binks's are perhaps the best burettes of their class, but are more difficult to manage than Mohr's.

I have lately made one with a peculiar form of glass stop-cock, which I find to answer well, and which any one who has had a little practice in the construction of tube apparatus, may make as follows:—

Take 18 or 20 inches of stout glass tube, about half an inch internal diameter, quite straight, and as cylindrical as possible both outside and inside. Heat one end carefully in the blowpipe flame, and widen it slightly for about a quarter of an inch; then direct the flame to a point about five-eighths of an inch from the end, and when sufficiently softened, pass an iron wire, previously bent for the purpose, into the tube, and press out the glass so as to form a nipple-like projection. Care must be taken not to heat too large a surface, or to press too strongly, else the sides of the tube will collapse.



Heat the little prominence again to redness, take hold of it with pliers, and gently draw it out. Cut off a piece of the point, and fuse the glass round the opening thus made, until only a small orifice remains. It should now resemble *c*, be about three-eighths of an inch long, and of good strength.

Next bend the tube somewhat sharply to a right angle, so that the delivery tube *c* shall have the position shown, and the limb *B* be about $1\frac{3}{4}$-inches long. Take next 3 inches of cylindrical glass rod, rather too large to enter the tube; cement one end to a bit of wood for a temporary handle, and with a flat cross-cut file, moistened with turpentine, make it slightly taper, and small enough to go in a little way; then grind it in with emery and water, occasionally using the file, until it fits well up to a point three-eighths of an inch beyond *c*, and finish the grinding with the finest emery. The plug should turn quite smoothly, and not allow the slightest leakage from *c*, or the end of the tube when *A* is filled with water.

This is the most tedious part of the work, but if a glass-cutter be accessible, he will do it for a trifling sum. Cut off now all but half an inch of the glass rod, and attach to this with Singer's cement the wooden lever *G*, which may be about $2\frac{1}{2}$-inches in length. Next, with the edge of a sharp triangular file, cut the little channel *d*. It must be very fine at its commencement, and gradually increase in size in its course to the end of the plug, to the axis of which it should be inclined about 45°. To prevent the displacement of the plug by the pressure of the column of fluid in *A*, make a loop at the end of a bit of moderately strong "elastic," slip it over *A*, cut the free end to a suitable length, make a loop on it, and fix it to the hook *f*, carried by the handle *G*.

The application of a minute portion of tallow to the plug facilitates its rotation, and is not, in general, objectionable.

The stop-cock being completed and the instrument filled, the operator, by moving the lever *G*, should be able to take with ease a drop or a fraction of a drop, a slow or rapid succession of drops, or a full stream. Any difficulty in

doing this is a proof that the channel is defective, and requires alteration. The graduation now remains to be done, about which I have a few words to say at a future opportunity.

Sheffield, April 9th, 1861.

REPORT OF THE

RESULTS OF PHYSICAL AND CHEMICAL INVESTIGATION,

AND OF THE

APPLICATIONS OF PHYSICS AND CHEMISTRY IN THE ARTS.

On the Valuation of Chloride of Lime.—Some years back Mr. Mercer suggested a process for assaying chloride of lime, depending on the use of ferrocyanide of potassium. This process will be found described in Parnell's work on Analysis. It consisted in adding so much of the chloride of lime to a known weight of the ferrocyanide as exactly to convert the latter into ferridcyanide. The available chlorine of the chloride reacting on the yellow prussiate in the usual manner:—

$$2\,(K_2, Fe\,Cy_3) + Cl = (K_3, Fe_2\,Cy_6) + KCl.$$

The exact point at which complete conversion had taken place was ascertained by taking out a drop of the liquid and testing it with a persalt of iron. Mr. Mercer's process does not appear to have obtained much attention from Chemists; quite recently, however, Dr. Davy, of Dublin, has been engaged in some experiments on the application of ferrocyanide of potassium to several analytical processes, and has, therefore, been led to examine this method and suggest several improvements in it.

Dr. Davy finds that Mr. Mercer's process gives no better results than the methods commonly in use, and that a certain loss of chlorine always occurs. He introduces, therefore, an important modification of the process by which this loss may be avoided. It depends on the action which ferrocyanide of potassium exerts on bichromate of potash. When these two salts are mixed in solution in presence of hydrochloric or sulphuric acid, the ferrocyanide is immediately converted into ferridcyanide. The following appears to be the reaction:—

$$6\,(K_2, Fe\,Cy_3) + KO, 2\,Cr\,O_3 + 7\,H\,Cl = 3\,(K_3\,Fe_2\,Cy_6) + 4\,K\,Cl + Cr_2\,Cl_3 + 7\,HO.$$

Dr. Davy applies this reaction thus:—He mixes together a certain quantity of a standard solution of ferrocyanide with a given amount of a graduated solution of the chloride of lime, using more of the former than the latter can convert, then adding hydrochloric acid to dissolve the precipitate formed and render the mixture strongly acid, and finally ascertain how much of the ferrocyanide remains unconverted by dropping in from a burette a standard solution of bichromate, till a minute drop taken from the mixture ceases to give a blue or greenish colour with a persalt of iron, but produces instead a yellowish-brown.*

The following is the method he recommends for applying this principle to commercial valuations:—

"Having obtained a flat-bottom flask or bottle which will contain 10,000 grains of distilled water when filled up to a certain mark in the neck, make two standard solutions, the first by placing in the flask or bottle 1190 (or exactly 1189.97†) grains of the purest crystallized ferrocyanide of potassium (yellow prussiate of potash) reduced to powder, adding distilled water to dissolve the salt, and when this is effected

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* The yellowish-brown coloration which is at first produced when enough of the bichromate has been added, quickly changes to a greenish colour by some secondary reactions which take place when the persalt of iron is left in contact with the mixture. But this does not interfere with the test; for it is the first effect which is produced which indicates the completion of the reaction, and not the after changes which may result.

† The above numbers are obtained as follows:—35.5 parts of chlorine are capable, as before stated, of converting 422.44 parts of the crystallized ferrocyanide of potassium into ferridcyanide; therefore 100 parts of the former will convert 1189.97 parts of the latter into the same compound. Again, as before observed, 1267.32 parts of the crystallized ferrocyanide require 147.59 parts of the bichromate of potash to convert them into the ferridcyanide; 1189.97 parts, therefore, will take 138.58 parts of that salt to produce the same effect.

filling up with water to the mark; and having mixed the solution thoroughly, place it in a well-stoppered bottle. The second standard solution is made in the same manner, substituting for the ferrocyanide 138.6 (or exactly 138.58) grains of bichromate of potash which has been purified by recrystallization and fused in a crucible at as low a heat as possible. Both these solutions will keep unchanged, and will answer for a number of determinations if they are preserved in well-stoppered bottles, and the ferrocyanide solution be kept, when not in use, excluded from the light. Get a burette or alkalimeter capable of holding or delivering 1000 grains of distilled water, and divided into 100 equal divisions; also two small bottles, one capable of delivering 1000 grains, and the other 500 grains of distilled water when filled up to a certain mark on the neck of each,* which may both be readily made by filling them with water, emptying them, and after they have drained for a minute or two, weighing into each the above weights of distilled water; or, what will be sufficiently accurate for most purposes, pour from the burette into one 100 divisions of distilled water, and into the other 50, and mark with a file where the fluid stands in the neck of each bottle. Having these already, take an average specimen of chloride of lime, and weigh out 100 grains of it, and make in the usual way a solution of it by trituration in a mortar with some water; pour it into the flask which was used in preparing the two standard solutions, and having filled up with water to the mark in the neck, mix the solution thoroughly; and before each time that any of the chloride of lime is taken out, shake well the contents of the flask.

"Measure out into a beaker-glass, by means of the two little bottles, 100 divisions of the chloride of lime solution, and 50 of the standard solution of ferrocyanide; and having mixed them well together, add some hydrochloric acid to dissolve the precipitate formed and acidify the mixture strongly; and having mixed the whole well, pour from the burette slowly the standard solution of bichromate (stirring well all the while) till a drop taken from the mixture and brought in contact with a drop of a very weak solution of perchloride of iron produces a yellowish-brown colour, as already noticed. Then read off the number of divisions of the standard solution of bichromate which was necessary to produce this effect; and this being deducted from 50, gives the per-centage by weight of chlorine.

"For the standard solution of ferrocyanide having been made so that the 10,000-grain measures should be equivalent to 100 grains of chlorine, and as every division of the burette equals 10 grains, each of these divisions of the ferrocyanide solution converted into ferridcyanide will indicate 0.1 grain of chlorine. Again, the 100 divisions of the solution of chloride of lime represent 10 grains of that substance, and we want to know how many divisions of the ferrocyanide solution its chlorine has converted into ferridcyanide. This is readily ascertained by the bichromate solution, which has been so graduated that each division represents a division of the ferrocyanide solution. So that to determine the per-centage of chlorine we have only to deduct, as before stated, the number of divisions of the bichromate solution employed from the 50 of the ferrocyanide solution, and the difference gives as the per-centage of chlorine by weight in the sample; thus in four experiments 50 divisions of the ferrocyanide solution mixed with 100 divisions of the solution of chloride of lime, required 18.5 divisions of the bichromate solution to convert the whole of the ferrocyanide employed into ferridcyanide; this number [taken from 50 leaves 31.5 divisions of ferrocyanide, which were converted into ferridcyanide by the chlorine of chloride of lime; and as each division represents 0.1 grain of chlorine, 31.5 will be equivalent to 3.15 grains of chlorine, which is the] amount contained in 10 grains of the sample; consequently 100 grains will contain 31.5 grains of chlorine, which is the same amount as is obtained by simply deducting the number of divisions of bichromate solution employed from 50 of ferrocyanide used in the estimation."

Though this process appears a long one, from the details which are necessary to explain its principle, yet in practice it is very expeditious, and requires only a very few minutes for its performance, and is much quicker than either Gay-Lussac's or Otto's method.

The great purity of commercial ferrocyanide of potassium, its definite composition,

* Two small pipettes capable of delivering the above quantities would be found still more convenient.

and the little tendency it has to change by keeping, constitute advantages of this process.

Dr. Davy also suggests in his paper the *use of dried ferrocyanide as a reducing flux.* He finds that it is quite as delicate, if not more so, than black flux, or cyanide of potassium, for the reduction of minute quantities of arsenic or mercury, while it has the great advantage of not being at all deliquescent. It does not require any admixture with a carbonated alkali.

On the Preparation of the Sulphocyanides.—M. A. Gelis has been engaged in studying the action of bisulphide of carbon on ammonia and sulphide of ammonium, and has devised a means by which the sulphocyanides may be prepared from these materials. Several sulphur salts are capable of being produced by the action of sulphide of carbon on ammonia. The author considers these bodies as directly comparable with the oxygen compounds of ammonia and carbon, as shown by the following series :—

Oxy-carbon series.

Carbonate of ammonia .....$C_2 O_6 N_2 H_8$
Anhydrous ditto (carbamate of ammonia).....$C_2 O_6 N_2 H_8 - 2 HO = C_2 O_4 N_2 H_6$
Cyanate of ammonia (carbamide, urea) .....$C_2 O_6 N_2 HS - 4 HO = C_2 O_2 N_2 H_4$

Sulpho-carbon series.

Sulphocarbonate of sulphide of ammonium .....$C_2 S_6 N_2 H_8$.
Sulphocarbamate of sulphide of ammonium .....$C_2 S_6 N_2 H_8 - 2 HS = C_2 S_4 N_2 H_6$
Sulphocyanide of ammonium (sulpho-cyanate of sulphide of ammonium .....) $C_2 S_6 N_2 H_8 - 4 HS = C_2 S_2 N_2 H_4$

The sulphocarbamate is formed by the direct union of sulphide of carbon with ammonia ($2 CS_2 + 2 NH_3 = C_2 S_4 N_2 H_6$). This body rapidly splits up into sulpho-cyanide of ammonium and sulphuretted hydrogen, $C_2 S_4 N_2 H_6 = C_2 NS, NH_4 S + 2 HS$.

When this change takes place in presence of still uncombined ammonia and sulphide of carbon, the sulphuretted hydrogen unites with the ammonia to form sulphide of ammonium, which, with the sulphide of carbon, gives the sulpho-carbonate of ammonium,

$$C S_2 + NH_4 S = NH_4 S, C S_2$$

If, therefore, sulphide of ammonium and sulphide of carbon be directly combined together, the sulpho-carbonate is at once produced. When this sulpho-carbonate is heated to 90° or 100° Cent., it is completely converted into sulpho-cyanide of ammonium and sulphuretted hydrogen,

$$2 (C S_2, NH_4 S) = NH_4 S, C_2 NS + 4 (HS)$$

It is upon these changes that M. Gelis's process for preparing sulpho-cyanides is founded. His process consists of two parts: first, the production of sulpho-carbonate of sulphide of ammonium; secondly, the decomposition of this body by a temperature of 90° or 100° Cent. The first part is effected by mixing sulphide of carbon with a concentrated solution of sulphide of ammonium and caustic ammonia. As these two liquids have different densities, and are not miscible, constant agitation would be required to keep them in contact during combination ; this is overcome very ingeniously by M. Gelis. He adds to the sulphide of carbon two or three per cent. of its weight of some oil, which, when brought into contact with the caustic ammonia, forms a thick gelatinous emulsion, thus effectually preventing any separation of the fluids. Under these circumstances, combination takes place rapidly, and after some hours is completed. This is known by the mass having resolved itself into a homogenous liquid, transparent, and of a brownish-red colour. The oil floats on the top, and may be used for another operation.

The ammoniacal solution of the sulpho-carbonate of sulphide of ammonium thus obtained, is poured into a retort and distilled. The temperature must be kept at 100° C., when the sulpho-carbonate is transformed into sulpho-cyanide of ammonium. Considerable quantities of sulphuretted hydrogen and of sulphide of ammonium are disengaged. The latter product is formed by the free ammonia which was added in the first part to facilitate the action. The following products then are obtained:— In the retort a colourless liquid containing only sulpho-cyanide of ammonium; in

the receiver, ammoniacal solutions of sulphide of ammonium; that is to say, the same kind of solution employed in the first part of the process. The contents of the receiver, therefore, may be used for treating a fresh quantity of sulphide of carbon.

From the sulpho-cyanide of ammonium the other sulpho-cyanides may be obtained. Thus, by pouring a solution of sulphide of potassium into the retort, sulpho-cyanide of potassium is formed, and the ammonia distils over as sulphide of ammonium.

Power of Copper to conduct Electricity.—Dr. Matthiesen and M. Holzman, after studying the effect of suboxide of copper, phosphorus, arsenic, sulphur, carbon, tin, zinc, iron, lead, silver, gold, &c., on the conducting power of pure copper, have come to the conclusion that there is no alloy of copper which conducts electricity better than the pure metal.

ON THE USEFUL PLANTS OF PARAGUAY.

BY DOMINGO PARODI.*

(*Continued from page* 518.)

Burro-iba (Guarani), *Tusilago* (Spanish); *Tussilago Farfara* (*Compositæ*).

Caá-águay-mi† (Guar.), *Yerba del estoraque* (Span.); Nat. ord. *Styraceæ*, genus *Styrax*. Possesses the same properties as the *Aguay-guazú* (p. 517).

Caáberá (Guar.), Nat. ord, *Asparagineæ*, genus *Dracæna?* The plant produces a small quantity of coloured resin having all the properties of Dragon's Blood. A gum resin resembling that of a *Pterocarpus*, common in the woods, is also collected. Both substances are used as astringents.

Caá-berá mí, Caá-cupechí, Ciervo-caá (Guar.), *Dictamo* (Span.); Nat. ord. *Labiatæ*. A plant of strong balsamic odour and bitterish aromatic taste. It is reputed efficacious against the bite of venomous serpents: antiseptic properties are likewise attributed to it.

Caábo-pochi, Cuchi-rupiá (Guar.), *Beleño* (Span.); Nat. ord. *Solanaceæ*, genus *Hyoscyamus*.

Caabo terey (Guar.); Nat. ord. *Loranthaceæ*, genus *Loranthus*. Various woody parasitic plants are designated by this name. The fruit contains a viscid mucilage, with which birdlime may be prepared.

Caá-cambuy (Guar.), *Lechetrezna* (Span.); Nat. ord. *Euphorbiaceæ*. A small plant having an acrid, caustic, milky juice. The decoction is employed as a wash for ill-conditioned ulcers: the leaves are used in the form of poultice to indolent tumours.

Caá-cangay (*Acangay*) (Guar.); Nat. ord. *Rubiaceæ*, genus *Galium*. A small plant, the root of which contains the same colouring principles as madder, and like it is used for dyeing. Combined with the wild cochineal, which is collected from the *Opuntia*, it produces a lively red, which is used in the dyeing of silk sashes.

Caá cati (Guar.), *Yerba buena acuática;* Nat. ord. *Labiatæ*, genus *Mentha*.

Caá-chi (Guar.), *Acebo amargo;* Nat. ord. *Ilicineæ*, genus *Ilex*. The leaves of this shrub are sometimes mixed with *Maté*, to which they impart a very decided bitter flavour.

Caá-curuzu or *Taperibá-mí* (Guar.), *Yerba sagrada ó de la cruz*; Nat. ord. *Verbenaceæ*. An aromatic herb, with a bitter taste: its decoction is used as a wash against baldness, also in zona, erysipelas, &c., as a gargle in *angina maligna*, and internally as a remedy in intermittent fevers.

Caá-hoby, Caá-hobi-mi (Guar.). *Añil* (Span.); Nat. ord. *Leguminosæ*, genus *Indigofera*. There are two varieties of this plant with which the indigo is prepared which is used to dye the cotton and woollen goods manufactured in the country. The *Caá-hobi-mi*, which abounds in the Missions, produces the better indigo.

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* *Revista Farmaceutica de Buenos Aires*, Jan,. 1861.

† The following are the significations of several Guarani words frequently employed in connexion with plants:—*Caá* or *Caabó*, plant, tree; *Ybá*, fruit; *Ybirá*, tree, wood, plant; *Yboty* or *Yboby*, flower; *Yci* or *Aicí*, gum, resin; *Alboy*, serpent; *Curé*, pig; *Tatá*, fire; *Y*, water; *Yuquí*, salt; *Guayú*, large; *mi, miní, mirí*, little; *Hobi*, green, blue; *Monoté*, white; *pará*, spotted; *Pitá* or *puytá*, red, flesh-coloured; *Tupí*, yellow; *Yró* or *Yraró*, bitter; *Pochi*, poisonous.

Caá-isi, Caá-isi-guazu (Guar.), *Lentisco* (Span.); Nat. ord. *Terebinthaceæ*, genus *Pistacia*. Resinous shrubs with oily seeds.

Caaimbé (Guar.), *Alhelí* (Span.); Nat. ord. *Cruciferæ*, genus *Cheiranthus*. An infusion of the petals, which is slightly aromatic and bitter, is used in hooping-cough.

Caaimbé-mí or *Ybapo guambaé* (Guar.), *Nardo céltico*; Nat. ord. *Valerianeæ*, genus *Valeriana*. A plant, the root of which is slightly aromatic and sweet, and of which there are two varieties. The flower, which is very aromatic, is used in infusion as stimulant, tonic, and diuretic.

Caá-mí (Guar.), *Yerba mate* (Span.); *Ilex paraguayensis* (*Ilicineæ*). The plant which produces the Paraguay Tea is wild, and grows, among other places, in the woods that line the shores of all the rivers and little streams which flow into the Paraná and the Uruguay, as also on the borders of the rivers whose waters unite themselves with the Paraguay, towards the east from 24° 30′ northward. They attain the dimensions of an orange-tree, but where the leaves are gathered the plant generally constitutes a shrub. The leaves are stripped off every two or three years, the intervening period being thought necessary for the tree to recover itself. The leaves do not fall in the winter; the trunk grows to the thickness of a man's thigh, and is covered with a smooth, whitish bark. The branches are directed upwards like the laurel, and the whole plant is compact and ramous. The *Maté* has been planted by the Jesuits for the sake of its leaves, which can be gathered from the cultivated trees with more convenience than from the wild.

Caá-ná (Guar.), *Acebo gigantesco* (Span.); *Ilex gigantea* (*Ilicineæ*). Sometimes the leaves of this plant are mixed with those of *I. paraguayensis* in preparing the *Yerba maté*.

Caá-parí-guazú (Guar.), *Alhelí grande* (Span.); genus *Matthiola* (*Cruciferæ*).

Caáparí-mí (Guar.), *Batatillas* (Span.); *Achyranthus* sp., also *Gomphrena* sp. (*Amaranthaceæ*), *Euphorbia* (*Euphorbiaceæ*).

Under the name of *Batatillas* are confounded the roots of various vegetables belonging to different genera, whose properties are usually purgative, becoming drastic and emetic if the dose be considerable. From the great variety of complaints in which it is used, *Gomphrena macrocephala* has become known in Brazil by the name of *Paratudo*.

Caápé, Caá uguay (Guar.), *Chicoria silvestre* (Span.); Nat. ord. *Compositæ*, genus *Cichorium*.

Caápé aisí (Guar.), *Balsamita* (Span.); Nat. ord. *Compositæ*, species *Tanacetum balsamita*. The whole plant has an agreeable mint-like odour, a bitter taste, and possesses powerfully stimulant properties. An infusion is used as an antispasmodic.

Caánambuy guazú, Caápé-guazú (Guar.), *Enula* (Span.); Nat. ord. *Compositæ*, genus *Inula*. The root, which is the part used, is large and fleshy, and of a pungent, aromatic taste, somewhat like pellitory. Boiled in wine, it is used as a poultice in sciatica, lumbago, &c. A syrup is also prepared from it, which is used with favourable effects as a stimulant and tonic in malignant fevers.

Caá-petay-hubay, Caá-piquí (Guar.), *Mastuerzo silvestre* (Span.); Nat. ord. *Cruciferæ*, genus *Nasturtium*; also *Parietaria officinalis* (*Urticeæ*). Much used as diuretics.

Caá-pitá-guazú (Guar.), *Consuelda* (Span.); Nat. ord. *Borragineæ*, genus *Symphytum*.—The root possesses the astringent properties of our *Radix Consolidæ*, but is more powerful.

Caá poní (Guar.), *Herniaria* (Span.).—Somewhat bitter and styptic, with a faint odour. Used as an astringent.

Caáponí-mi-quiru (Guar.), *Hiedraterrestre* (Span.); Nat. ord. *Labiatæ*, genus *Glechoma*.—Aromatic, bitter, slightly astringent. Used in infusion as tea in affections of the chest.

Caá-quiriri (Guar.), *Fumaria* (Span.); Nat. ord. *Papaveraceæ*, genus *Fumaria*.—Used as an emmenagogue.

(*To be continued.*)

THE SPONGE FISHERY OF THE BAHAMAS.

BY P. L. SIMMONDS.

In our first number, at page 17,* we gave an account of the sponge fishery of the Ottoman Archipelago, from which the finer descriptions of sponge are obtained. The coarser descriptions entering into commerce are procured about the Bahama banks and the coast of Florida. From 1000 to 1500 bales of sponge of 300lbs. each are shipped from Nassau, New Providence, annually.

Sponge fishing is said to have become a very profitable business in the neighbourhood of Key West, Florida. About 100,000lbs. are reported to have been gathered during last year, and the sales amounted to 25,000 dols. The article is mostly procured by natives of the Bahamas. This is a new branch of business for Key West, and was formerly confined to the Mediterranean. The finer quality of sponge is not found on the American coasts, although the coarse description is abundant all about the coast of Florida and the Bahama banks.

The principal supply of West India sponge comes from the Bahama Islands. The rapid strides made in sponging within this group since 1847 appears almost incredible. Although the trade has been carried on for years, a Mr. Hayman was, I am informed the first who gave it an impetus. About the streets and outskirts of Nassau, New Providence, vast quantities of sponge may be seen covering fences, yards, and house-tops, where it is left to dry, after having been previously buried (in order to kill the zoophyte which inhabits it) and washed. It is afterwards divested of the fragments of rock which adhere to it, pressed, and packed in bales, averaging 300lbs. weight each, for the London market, where it is manufactured into cloth, hats, &c., and converted to many useful purposes. The value of sponge in surgery and for domestic uses is well known. Spongio-piline has recently become the medium for applying poultices to wounds instead of cloth.

To show the importance of the sponge trade in the Bahamas I may add the following statistics, with which I have been favoured by a gentleman engaged in shipping large quantities. "From Jan. 1 to June 30, 1850, there were exported from Nassau nearly 1000 bales of sponge, of the value of at least £5 per bale = £5000. On Jan. 1 a very small stock of sponge was on hand, while on June 30 every dealer in this article had a large stock; therefore, as it is a cash article, there must have been paid to the crews employed in this trade at least £8000." The value of the sponge exported from the Bahamas in 1852 was about £12,000.

The sponge trade of the Bahamas is in a very flourishing condition. The total value exported in 1849 was but £2,217; in 1850, £5700; in 1851, £14,000; in 1852, £11,257. In later years the quantity of sponge exported from the Bahamas has been:—

	Cwts.	Value.
1855	2399	£9,615
1856	1800	6,723
1857	2657	11,025
1858	3357	17,258

A great deal of this goes to the United States.

The Andros Islands and the Cays are the great sponging districts. The sponge is usually found in grassy and rocky patches near the shores of this group. Crawls for cleaning these may be seen from Joulters to Jonas Cays, constructed with stakes about two inches thick, driven into the mud, and forming a square of twelve feet, sufficiently high to prevent the sponge washing out. In these the sponge is soaked and washed frequently, after having been buried in sand about a week or ten days, when it loses the black animal matter, which has an offensive smell. When first gathered the pieces are wrenched from the rocks with a strong two-pronged fork fixed to a long pole. The sponges are of four kinds—yellow, glove, velvet, and mop. The first is the most valuable kind, selling at about 1*s.* the lb.; the second at 9*d.*; the velvet is the toughest, and much used in stables for its softness; the last kind is very inferior, and only used for mops. At the foregoing prices it scarcely repays the outfit, but 1*s.* 3*d.* a pound about remunerates the fishermen.

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* See also *Pharmaceutical Journal*, vol. ii., Second Series, page 335.

The imports of sponge from the Bahamas and United States during the past seven years have been as follows, in pounds:—

	Bahamas.	United States.
1853	91,736	23,774
1854	115,213	33,159
1855	120,013	14,936
1856	79,893	3,271
1857	167,051	——
1858	226,094	7,693
1859	207,450	7,234

—*The Technologist.*

NOTE ON FRENCH OPIUM.

BY M. H. LEPAGE, PHARMACIEN.

For some years past, many persons, amongst whom it is but right to place foremost M. Aubergier, of Clermond-Ferrand, have been engaged in the collection of opium, one of the most precious drugs of the Materia Medica.

If the different species or varieties of the genus *Papaver* yield opium, all do not produce it in equal quantities. Thus, the white officinal poppy, the pink poppy, and the purple poppy, upon which experiments have been especially made, must be arranged in the following order as regards their produce: 1, the white poppy; 2, the purple-brown poppy; 3, the pink poppy. On the other hand, the opium obtained from these different poppies must be classed as follows, according to their richness in morphia: 1, opium from the pink poppy; 2, that from the purple; 3, that from the white officinal poppy. Thus, whilst the opium from the pink poppy yields from 14 to 23 per cent. of morphia, that of the white poppy never contains more than from 5 to 8 per cent. As to the opium from the purple poppy, which appears to be that in which the quantity of morphia varies the least, it yields from 10 to 12 per cent. These facts result from the united experience of MM. Aubergier, Decharmes, Bénard, O'Reveil, and Miallhe. (See *Pharmaceutical Journal*, vol. ii., series 2, page 229.)

With such results, I ask myself, if the collection of opium is a work which may really be put in practice without much trouble, why Pharmaceutists who are placed in favourable situations, as most are who live in small towns, do not take upon themselves this cultivation, were it only for their own consumption? For my part, I set to work, and have obtained, as you will see below, very satisfactory results. I began my experiments in 1857, and repeated them in 1858 and 1859. It is the brown-purple poppy that I cultivate, as yielding opium in which the proportion of morphia varies the least, and also that in which the proportion is similar to that which the best foreign opium used in pharmaceutical preparations should contain. Here is the summary of my proceedings:—

In soil well manured, in March, from the 1st to the 15th, I sow in rows, 25 centimetres apart (nearly 10 inches), my poppy-seed mixed with a little sand; I then roll it, and when the plant is well up, that is to say, in about four or five weeks, the weeds which have sprung up between the rows, and which must injure the development of the young plant, are cut away; a little later, towards the 15th of May, it is necessary to weed with the hand, an operation which not only destroys the weeds, but also helps to thin the poppy plants, for these latter are always too thick, whatever precaution may be taken in the process of sowing. The weeding ended, nothing remains to be done until the time for collecting the opium, which takes place generally from the 8th to the 15th of July.

Moreover, if it is important not to wait until the capsules begin to turn yellow before the incisions are made, it is equally so not to begin on capsules yet too green, unless you wish to see the juice, yet too thin, run down and partly be lost. Experience will very soon show when it is time to begin the work; but at this point the operations must be conducted judiciously, for when the poppies begin to turn yellow, the juice flows scarcely at all. The laticiferous vessels being at the circumference of the capsules, a superficial incision is sufficient to reach them, whilst an incision which would penetrate within the capsule would permit a portion of the

juice to flow into it, and would thus diminish by so much the produce. More than this, it would cause a disappointment in the loss of some of the seeds when the capsule was ripe. The incisions should be circular rather than perpendicular. The same capsules may be incised two or three times, with an interval of twenty-four hours, and will supply each time a fresh quantity of opium.

A good operator may collect 100 grammes of opium in a day, but more frequently only from 70 to 80. A method of accelerating the operation consists in one person making the incisions whilst another takes away the juice; in which case, it is well that the person who incises should be at least an hour at his work in advance of the one who collects, so as to give the opium juice time to partly harden on the capsule.

The juice collected each day should immediately be spread in thin layers upon plates, and placed in a spot heated to 30 or 35 degrees, in order to dry it quickly,* and when the gathering is over, the whole is mixed in a marble mortar, and produces a paste of sufficient consistence to form into cakes of from 50 to 100 grammes each. These latter are further dried in the open air. It is in this way that we obtained the opium which we sent in 1859 to the exposition of Rouen.

I found, in the opium of my gathering of 1857, by the excellent process of M. Fordos, 12.50 per cent. of morphia; M. Réveil, however, to whom I sent a sample, could find but 11 per cent., following the same process. The opium of this year's gathering has produced me 11.50 per cent.

After the collection of the opium, that of the capsules must be attended to when they are ripe, in order to remove the seeds, which yield a valuable fixed oil.

I subjoin a table of the cost of the opium which I gathered in 1859:—

	fr.	cen.
Rent of 8 ares (about one-fifth of an acre), at 2 fr. per are...	16	0
Manure	10	0
Labour	6	0
Sowing	10	0
Weeding	5	75
Expenses of collecting the opium.....	21	75
Total.....	69	50

Produce obtained:—500 grammes of opium; 48 kilogrammes of seed, which have furnished 17 kilogrammes of oil, in value 27 fr. 20 c. There remain then 42 fr. 30 c. for the 500 grammes of opium.—*Echo Médical de Neuchâtel*, and *Journal de Pharmacie d'Anvers*.

ALCOHOL: ITS ACTION AND USES.

The question of the action of alcohol on the system, and its value as a dietetic and therapeutic agent, is now attracting much attention both amongst the members of our profession and the scientific world at large. No doubt can be entertained of the importance of a consideration of the subject—a consideration, however, into which our limits will not allow us fully to enter. If there were one cherished view which we thought chemistry had taught us, it was surely that alcohol was oxidised in the system, and thus made subservient, if not to the formation of some of the tissues of the body, at any rate to the maintenance of animal heat. However indisposed physiologists may have been of late years to give in their adhesion to the theories of Liebig as to the division of alimentary materials, we think that most have been, and probably many will still be, disposed to consider the substance we are speaking of in the light of a heat-producing agent. Our opinions on this point have, however, been somewhat rudely assailed, and the position which alcohol has occupied as a dietetic article is threatened with imminent danger. As from the chemists we received the theory of its combustible nature, so from chemical research and experi-

* According to M. Bénard, if the opium juice be dried too slowly, a part of the morphia which it contains is transformed into another substance.

ments now comes the opposite doctrine of its entire elimination, unchanged, from the body.

Considering the vast amount of alcohol which is daily consumed, whether as a general article of diet, or in the treatment of disease, it becomes a matter of essential importance that correct principles should be laid down with reference to its *modus operandi*, and the manner in which it is disposed of in the system. We cordially hail, therefore, the appearance of the work of Messrs. Lallemand, Perrin, and Duroy (*Du Rôle de l'Alcohol et des Anesthésiques dans l'Organisme*, Paris, 1860), which gives us the results of the most recent experiments and researches on the subject. A careful perusal of this work has convinced us that some of our views of the dietetic value of alcohol require modification; but we cannot, on that account, allow the evidence which is brought forward, and which does not appear to us conclusive on the point, to make us discard altogether the substance of which we are speaking from our list of alimentary materials.

If we were briefly to sum up the facts which the researches of the above authors seem to have established, they would be these:—That, after any fluid containing alcohol is taken, the latter becomes eliminated, unchanged, by the various secreting organs—the skin—the liver—the kidneys—the lungs; and not only this, but that it is deposited in all the tissues, and can be extracted alike from the substance of the brain, the liver, the muscles, and the cellular tissue, as well as from the blood. It is right to observe that, even when small quantities of alcohol were taken, traces of it could be found in the excretions; thus proving that it is not simply when the substance is taken in excess that it becomes eliminated without change.

From the results of their experiments, MM. Lallemand, Perrin, and Duroy think they are justified in concluding that all the alcohol ingested, with the exception of a small quantity which they and other experimenters have found converted into acetic acid in the stomach, is eliminated from the body, without undergoing any change whatever; and that in this respect it resembles in its action the various anæsthetic agents, such as chloroform, &c. From these conclusions necessarily follows the inference, that alcohol cannot be considered in the light of an alimentary substance.

We believe Dr. Percy was the first to show that, after poisoning by alcohol, this substance could be found in the ventricles of the brain, as well as in the brain-matter itself; and we are all aware of the fact, that fumes of alcohol are exhaled from the lungs even when only a small quantity of the fluid has been swallowed. The chief points that are new, which have been brought to light by the investigations of our authors, are the elimination of the alcohol unchanged through the medium of the skin, the kidneys, &c.; and its deposit in the tissues generally. It is true that Klenke had demonstrated the presence of alcohol in the urine and bile; but with this exception, physiologists had advanced the opinion that the secreting organs did not eliminate the substance.

There cannot be a doubt of the great importance and value of the researches of M. Lallemand and his coadjutors; for, supposing their results to be trustworthy—and we believe them to be so—they establish beyond a doubt the fact that, at any rate, a portion of all ingested alcohol may go the round of the circulation, traverse the various capillaries of the body, and without undergoing any oxidation whatever, be ejected from the system in the different secretions. This portion, therefore, cannot be concerned in building up the fabric of the body, nor can it by its combustion contribute to the maintenance of animal heat. This is surely an important conclusion to have arrived at. The weak point, however, in the arguments adduced against the value of alcohol as a respiratory food, is the small quantity of it which the experimenters have been able to extract from the various secretions. It is possible that, by more delicate modes of investigation, and by the use of more subtle tests, a much larger proportion may be detected; but we are inclined to think that, until some such result is obtained, physiologists will not be disposed to abandon their views as to the oxidizable nature of the substance.—*Extract from article in British Medical Journal.—Dublin Medical Press.*

ON THE NON-EXISTENCE OF A BICARBONATE OF LIME IN CARBONATED WATERS.

BY EMERSON J. RENOLDS.

THE following paper was read at a meeting of the Dublin Chemical Society:—

In the treatises on chemistry, it is generally asserted that bicarbonate of lime is found when the carbonate of that base is dissolved in water containing carbonic acid, but no one has determined the actual amount of gas required to dissolve a given weight of the pure carbonate of lime. The method which I adopted in order to accomplish this was the following:—I first generated the gas, and when properly dried (which was effected by passing it through strong sulphuric acid and chloride of calcium), I conducted it into the first, or larger flask, in the alkali-metrical arrangement of Fresenius and Will, which contained 1000 grains of pure lime-water, the strength of which had been previously accurately determined, this flask being connected in the usual manner with the smaller one, containing strong sulphuric acid, through which the excess of gas had to bubble, and consequently any moisture that was carried over was retained, and in this way prevented loss. The two flasks were carefully weighed before commencing the experiment. When carbonic acid gas first passes through lime-water carbonate of lime is formed, but by continuing the slow stream of gas, and frequently agitating the flask, re-solution is effected.

Now, on drawing a stream of dry air through the apparatus, and re-weighing, the increase in weight will indicate the amount of gas absorbed by the lime-water, for the purpose of forming the neutral carbonate of lime and of dissolving it again.

The next stage of the experiment consists in manipulating, as in ordinary alkalimetrical determinations; again drawing a stream of dry air through the apparatus, and weighing; the loss will now give the amount of carbonic acid used in the first instance, and act as a check on the former results.

Having described the method of conducting the experiment, I will now speak of the results which I have obtained. Before doing so, however, let me draw your attention to the advantage of using lime-water instead of the anhydrous carbonate of lime. In the first place, it is much easier to dissolve a moist precipitate than a dry powder in any menstruum. And, secondly, the quantity of water employed together with the time which should elapse before complete solution could be effected, would be more than sufficient to dissolve a quantity of gas, which would lead to the supposition that a bicarbonate of lime was formed—not that I mean to say that the amount of lime-water I use is not quite enough to lead to the same idea, but having the carbonate of lime in this easily soluble condition, and in consequence of the shaking, the water has only time to dissolve just sufficient gas to cause complete solution to take place, and no more; at least such are the conclusions my experiments seem to warrant. Like most other cases of solution it is much facilitated by agitation.

I give the following results of four experiments which I have selected from several others, as showing the greatest difference:—

Experiment. No.	Increase in weight on re-dissolving ppt.	Amount of CO_2 required to dissolve 2.5 grs. CaO, CO_2.	Degree of agitation and time.
1	1.390	.290	Continuous, 4 m.
2	1.400	.300	Nearly the same.
3	1.530	.430	Less, 8 min.
4	2.300	1.200	None, 18 min.

The quantity of lime-water used in each experiment was 1000 grains, and the quantity of actual lime present was 1.400 grains, the same being used in all.

Now, 1.400 grains of lime would require to form with it a neutral carbonate, 1.1 grains of carbonic acid, so that having found what the increase in weight is in each experiment, the quantity 1.1 must be deducted; the remainder will be the amount of gas required to effect the solution of 2.5 grains of carbonate of lime. It

will be easily seen from the above table that the amount of gas absorbed varies according to the degree of agitation. In order to explain what I mean, it will be necessary to go back for a moment to the table given above; it will be seen from this that the *time* employed in performing each experiment is greater as the agitation is less, and *vice versâ;* for in experiment No. 1 the time occupied in dissolving the precipitate was only four minutes, whereas in experiment No. 4 it required nearly eighteen minutes to effect the same purpose, but in the latter case no agitation was used, further than was caused by the slow passage of bubbles of gas.

There is another experiment which I tried, namely, the action of a solution of litmus on water impregnated with gas, and on water containing carbonate of lime held in solution by exactly the same quantity of gas as was contained in the other. This appears to be a very easy experiment, but it is in reality very difficult to obtain accurate results with it, in consequence of the fact, that the litmus does not change at once from a red to its natural purplish colour, but goes through the intermediate gradations of shade which requires considerable practice to enable the operator to recognize.

I find that the best way to proceed is the following:—Take both solutions and place them opposite to a sheet of white paper; then keeping the eye a little above the level of the liquid, add the standard solution of litmus, until, on shaking, a purple tint is noticed; then treat the second solution in the same way, until the same colour is produced, each time, of course, reading off the quantity of litmus solution used. After frequent practice in this way, the eye becomes accustomed to the change of colour.

Now, it is evident that if all the carbonic acid present were in combination with the lime that it would affect the colour of the test much less than if the carbonate of lime had been mechanically dissolved by a portion of this acid. I tried this in the following way:—I charged pure distilled water with carbonic acid gas in a gasogene; I then took some of this solution and left it exposed to the air for three or four hours, in order to allow the excess of gas to escape; 1000 grains of this water was now taken and placed in a bottle with three grains of pure carbonate of lime, carefully shaking occasionally until dissolved; the same quantity was put into another bottle by itself. On adding, from a burette, the infusion of litmus, eighty-four measures were used before the purple tint was observed in the bottle containing the carbonate of lime; now the test was added to the bottle which had the aqueous solution of carbonic acid in it, when eighty-five measures were used. I repeated this experiment upwards of thirty times, with nearly the same results. Three times the quantities were just the same. From the results of these experiments, I think I may conclude that, under the circumstances, a bicarbonate of lime is *not* formed, but that it is merely a solution of CaO in CO_2. Indeed, there are many cases in which the presence of an acid favours the solution of a substance otherwise insoluble, or nearly so, in plain water. There is no instance in chemistry of a bicarbonate being so loosely constituted as to lose one equivalent of its acid by mere exposure to the air; even magnesia, which is known to exist as a bicarbonate, both in solution and in the solid state, loses only one-fourth of its carbonic acid, and is deposited in the state of sesqui-carbonate, as has recently been shown.—*Dublin Hospital Gazette.*

ON BUNSEN AND KIRCHHOFF'S SPECTRUM OBSERVATIONS.

BY HENRY ENFIELD ROSCOE, ESQ.,
Professor of Chemistry in Owens College, Manchester.

(*Delivered at the Royal Institution, March* 1, 1861.)

The speaker commenced by stating that the researches of Bunsen and Kirchhoff which he had the honour of bringing before his audience, marked a new era in the science of Analytical Chemistry; that by means of these discoveries the composition of terrestrial matter becomes revealed to us with a degree of accuracy and delicacy as yet unheard of, so that chemical elements supposed to be of rare and singular occurrence, are shown to be most commonly and widely distributed, and on the first

practical application of this new method of analysis two new and hitherto undetected alkaline metals have been discovered.

The importance of these researches becomes still more strikingly apparent, when we hear that the conclusions derived from them outstep the bounds of our planet, enabling us to determine with all the certainty of definite experiment the actual presence of a number of elementary bodies in the sun.

The colours which certain bodies impart to flame, have long been used by chemists as a test for the presence of such bodies. Thus soda brought into a colourless flame produces a bright yellow light, and substances containing soda in any form give this yellow colour. Potash gives a violet flame, lithia and strontia impart to flame a crimson colour, whilst salts of barium tinge it green. These colours are produced by the incandescence or luminosity of the heated vapour of the various bodies placed in the flame. It is only because these substances are volatile, or become gases at the temperature of the flame, that we observe the peculiar colour. If any substance, such as platinum, which is not volatile at the temperature of the flame, be placed in it, no coloration is observed. The higher the temperature of the flame into which the same substance is placed, the greater will be the luminosity; and the more volatile the salt of the same metal, the more intense is the light produced.

Heated to the point of incandescence in any other manner, the vapours of these metals and their salts give out the same coloured light. Thus, if we burn gun-cotton, or gun-paper, steeped in solutions of these various salts, we get the characteristic colours. The well-known coloured fires owe their peculiar effects to the ignition of the vapour of some particular substance. Thus, in red fire we have strontium, in green fire we have barium salts present in the state of luminous vapour.

These facts have long been known and applied, but it was reserved for Bunsen and Kirchhoff to place these beautiful phenomena in their true position, to apply to them the modern methods of exact research, and thus to open out a new and rich field for most important investigations. This they accomplished in a most simple and beautiful manner, by examining these coloured flames, not by the naked eye, but by means of a prism or an apparatus for separating, decomposing, or splitting up the light produced by the incandescent vapour into its different constituent parts.

If we pass white sun-light through a prism, we get the well-known solar spectrum discovered by Newton. The red, or least refrangible rays appear at one end, and we pass through all gradations of colour—noticing on our way certain dark lines or spaces, showing the absence in solar light of some particular rays, lines with which we shall have much to do—until we arrive at the violet, or most refrangible end of the spectrum. If instead of using white sun-light, we pass the rays from the yellow soda flame through the prism, we get the soda spectrum; and we find that instead of a continuous spectrum, all we see is one bright yellow line, showing that every kind of light except that bright yellow ray, is absent in the soda flame; or that the soda flame gives out only one *kind* of light.

And as each metal, sodium, potassium, lithium, calcium, strontium, barium, &c., communicates a distinct tint to flame, so each gives a distinct and characteristic spectrum, consisting of certain bright coloured lines, or bands of light of the most peculiar form and tint.

The actual spectra of these metals can be beautifully seen in the simple apparatus designed by Bunsen and Kirchhoff.

In each spectrum of these metals, the form, number, position, colour, and tone of the bright lines remain perfectly constant and unvarying, so that from the presence or absence of one of these lines, we may with absolute certainty draw conclusions respecting the presence or absence of the particular metal, as we know of no two substances which produce the same bright lines. None of the bright lines produced by any one metal interfere in the least with those of any other, and in a mixture of all these metallic salts together, each ingredient can thus be easily detected.

As an example of the exactitude with which a very small quantity of a most complicated mixture can thus be analyzed, the speaker quoted Bunsen's words. "I took," says Bunsen, "a mixture of chloride of sodium, chloride of potassium, chloride of lithium, chloride of calcium, chloride of strontium, chloride of barium, containing at most $\frac{1}{10000}$ part of a grain of each substance. This mixture I put into the flame, and observed the result. First, the intense yellow sodium line

appeared, on a background of a pale continuous spectrum; as this began to be less distinct, the pale potassium lines were seen, and then the red lithium line came out, whilst the barium lines appeared in all their vividness. The sodium, lithium, potassium, and barium salts were now almost all volatilized, and after a few moments the strontium and calcium lines came out, as from a dissolving view, gradually attaining their characteristic brightness and form."

We can thus detect the most minute traces of any one of these bodies, if mixed with the largest quantities of any other substance. The delicacy and accuracy of these reactions is without parallel, as is seen from the following statements:—

1. *Soda* $\frac{1}{3000000}$ part of a milligramme, or $\frac{1}{180000000}$ part of a grain of soda can be detected. Soda is always present in the air. All bodies exposed to air show the yellow sodium line. If a book be dusted near the flame the soda light can be seen.

2. *Lithia* $\frac{1}{100000}$ part of a milligramme, or $\frac{1}{6000000}$ part of a grain of lithia can easily be detected. Lithium was only known to occur in four minerals. It is now found by spectrum analysis to be one of the most widely distributed elements. It exists in almost all rocks; it has been found in 3 cubic inches of sea, river, and Thames water; in the ashes of tobacco, and most plants; in milk, human blood, and muscular tissue.

3. *Strontia* $\frac{6}{100000}$ of a milligramme, or $\frac{1}{1000000}$ part of a grain of strontia can be easily detected.

4. *Lime* $\frac{1}{100000}$ of a milligramme, or $\frac{1}{1000000}$ of a grain may be easily detected.

In examining the spectra of the alkalies obtained from certain mineral waters, Bunsen observed the occurrence of two bright blue lines which he had not seen before, when he examined alkalies from other sources. Hence he concluded that these bright lines must be produced by a new, hitherto undetected, alkaline metal. Subsequent search proved the validity of the supposition. The new metal was found and isolated. The analogy between this discovery and a celebrated one in another branch of physical science, will be at once understood. As Adams and Leverrier discovered Neptune, so Bunsen discovered "*Cæsium*" by the perturbations produced in the spectra of the other alkaline metals.

This is, however, not all. A few days ago the speaker received a letter from Bunsen, which contains the following most interesting information:—"The substance which I sent you as impure tartrate of Cæsium contains *a second* new alkaline metal. I am at present engaged in preparing its compounds. I hope soon to be able to give you more detailed information concerning it. The spectrum of the new metal consists of two splendid red lines situated beyond the red line K *a* in the ultra red portion of the solar spectrum. Hence I propose to call the new metal '*Rubidium*.'"

That this same method of investigation can be extended to all the metallic elements is more than probable, for Kirchhoff writes—"I have assured myself that even the metals of the rarest earths, as yttrium, erbium, and terbium, can be most quickly and certainly determined by help of the spectrum analytical method."

Experiments are being carried on with the view of making this mode of examination practically applicable to all metals.

To turn, now, to the second, and, if possible, to the more interesting part of the subject, namely, the conclusions drawn from these observations respecting the composition of the sun's atmosphere. The solar spectrum invariably contains a large number of dark lines, or spaces, or shadows. These have been called Fraunhofer's Lines, from the name of their discoverer. They show us that in the sun's light certain kind of rays are wanting; and as these lines are always present, exactly in the same position, we see that certain kinds of rays are always absent in solar light. There are many thousands of these lines in the whole length of the spectrum. Only a few have been, as yet, mapped and named.

What is the cause of these constant dark lines? And we must remember that it is in sun-light alone that these particular lines occur; in the light of the fixed stars, as well as in artificial lights, other lines are found. It is the discovery of this cause by Kirchhoff which gives the subject such peculiar interest, as it enables us to draw conclusions respecting the composition of the sun's atmosphere. The points of the case are put as concisely as possible under the following heads:—

1. The solar spectrum invariably contains certain fixed *dark* lines, called Fraunhofer's Lines.

2. The spectra produced by the luminous vapour of all metals contain certain fixed *bright* lines, invariable, and distinct for each metal.

3. All and each of the bright lines thus produced by certain metals—viz. sodium, potassium, magnesium, and iron, are found to coincide exactly with certain of the dark lines of the solar spectrum.

4. Hence there must be some connexion between the bright lines of the metal, and the dark solar lines.

5. The connexion is as follows:—Each of the dark fixed lines in the solar spectrum is caused by the presence in the sun's atmosphere of the luminous vapour of that metal which gives the coincident bright line.

By taking a special case we may more easily understand the matter. Let us examine the question why it is to be concluded that *Sodium* occurs in the sun's atmosphere? In the following sentences the reasoning on this subject is rendered clear:—

1. The light emitted by luminous sodium vapour is homogeneous. The sodium spectrum consists of one double bright yellow line.

2. This bright double sodium line is exactly coincident with Fraunhofer's dark double line D.

3. The spectrum of a Drummond's Light (like that of all incandescent solids) is continuous. It contains no dark lines or spaces.

4. If between the prism and the Drummond's Light a soda flame be placed, a dark double line identical with Fraunhofer's dark double line D is produced.

5. If instead of using Drummond's Light we pass sun-light through the soda flame, we see that the line D becomes much more distinct than when sunlight alone is employed.

6. The sodium flame has, therefore, the power of absorbing the same kind of rays as it emits. It is opaque for the yellow "D" rays.

7. Hence we conclude that luminous sodium vapour in the sun's atmosphere causes Fraunhofer's dark double line D. The light given off from the sun's solid body producing a continuous spectrum.

8. In a similar manner the presence in the solar atmosphere of potassium, iron, magnesium, nickel, and chromium has been proved.

Kirchhoff's own words may perhaps render this matter still more plain. "The sun," says Kirchhoff, "consists of a glowing gaseous atmosphere, surrounding a solid nucleus which possesses a still higher temperature. If we could see the spectrum of the solar atmosphere without that of the solid nucleus we should notice in it the bright lines which are characteristic of the metals it contains. The more intense luminosity of the internal nucleus does not, however, permit the spectrum of the solar atmosphere to become apparent; it is *reversed* according to my newly discovered proposition; so that, instead of the *bright* lines which the luminous atmosphere by itself would have shown, *dark* ones appear. We do not see the spectrum of the solar atmosphere itself, but a negative image of it. This case, however, with an equal degree of certainty, serves to detect the metals present in the sun's atmosphere. All that we require for this purpose is a very accurate knowledge of the solar spectrum, and of the spectra of the individual metals."

Kirchhoff is at present engaged in continuing these observations; and although only eighteen months have elapsed since the first discovery was made, he has already mapped more than seventy lines in the solar spectrum, between D and E, which are produced by iron. He has shown that the well-known group in the green known as *b*, is caused by magnesium, whilst other coincident lines prove the presence of nickel, chronium, potassium, and sodium in the solar atmosphere.

The speaker regretted that he was unable to show even a drawing of the coincident lines, as no representation of them has yet been completed.

The lines produced by many metals possessing very distinctly marked spectra are seen to coincide with *none* of the dark solar lines; and hence the conclusion is drawn, that these metals—for instance, silver, copper, zinc, aluminium, cobalt, lead, and antimony—do not occur at all, or at any rate occur only in very small quantities in the sun's atmosphere.

The speaker said that he should not soon forget the impression produced on his mind when visiting his friends in Heidelberg last autumn, by seeing the splendid spectacle

of the coincidence of the bright lines of the iron spectrum with the dark solar lines. In the lower half of the field of the telescope were at least seventy brilliant iron lines of various colours, and of all degrees of intensity and of breadth ; whilst in the upper half of the field, the solar spectrum, cut up, as it were, by hundreds of dark lines, exhibited its steady light. Situated *exactly* above each of the seventy bright iron lines was a dark solar line. These lines did not only coincide with a degree of sharpness and precision perfectly marvellous, but the intensity and breadth of each bright line was so accurately preserved in its dark representative, that the truth of the assertion that iron was contained in the sun, flashed upon the mind at once.

The speaker concluded by remarking that these researches are still in their earliest infancy; that the dawn of a new stellar and terrestrial chemistry has been announced, thus opening out for investigation a bright prospect of vast fields of unexplored truth.

THE KREUZNACH WATERS.

THERE are six springs at this place, of nearly equal chemical composition, of which the most famous is the Elisenbrunnen. The water has a saline taste, and is almost colourless when taken from the spring; but if it stands for some time it becomes turbid, and a yellow-brownish sediment is formed. In one pound of the water (7680 grains) are contained—

	Grains.
Chloride of sodium	72.922
Chloride of calcium	13.277
Chloride of magnesium	0.251
Chloride of potassium	0.972
Chloride of lithium	0.075
Bromide of sodium	0.307
Iodide of sodium	0.003
Carbonate of baryta	0.299
Carbonate of magnesia	1.351
Carbonate of strontia	0.682
Carbonate of iron	0.199
Carbonate of manganese	0.001
Silica	0.314
Alumina	0.021
Water	7589.314

One of the most important remedial agents at our disposal is the mother-liquor which remains after the water from the springs has been boiled, and the larger part of the chloride of sodium, silica, carbonate of lime, carbonate of magnesia, alumina, iron, and manganese have been removed. This liquid is generally white, but sometimes it has a brownish or yellowish colour; it has an oily consistency, a bitter and unpleasant taste, and feels like a mixture of sand and oil. In one pound of mother-liquor are contained—

	Grains.
Chloride of calcium	1789.97
Chloride of magnesium	230.81
Chloride of potassium	168.31
Chloride of aluminium	1.56
Chloride of sodium	226.37
Bromide of sodium	59.14
Iodide of sodium	0.05
Chloride of lithium	7.95

and traces of perchloride of iron, chloride of manganese, and phosphoric acid. As large quantities of this liquid are exported, and there was some difficulty connected with the manner of sending it, because, on account of its great specific gravity, it penetrated the joints of the tubs and escaped, especially if it was sent to any distance, the idea occurred to the authorities of having the liquid concentrated to such a degree that, after refrigeration, it would form a hard substance. This is called the salt of mother-liquor. There is, however, a great objection to this proceeding, which

Dr. Michels, one of the physicians of this place, has first pointed out to the profession; for as the concentrated mother-liquor is poured into the tubs while hot, crystallization ensues in them after refrigeration, and the different salts contained in the liquor having different points of crystallization, they, of course, crystallize in layers, of which those at the top of the tub are quite different from those at the bottom. If, therefore, one layer is used after the other, the baths only contain certain parts of the mother-liquor, but never the whole of it, so that its efficacy is lost. It is true that one might again dissolve the whole contents of the tub; but this would be a very inconvenient and troublesome process, and it is, therefore, much better to use it in the liquid state, as was originally done; and if sent in bottles covered with wicker work it travels quite safely. We also use brine which is highly concentrated in special factories, and which contains, among other elements, more than five grains of bromide of magnesium in sixteen ounces. Even the air in and around the houses where the brine is concentrated may be considered a remedial agent; it greatly resembles the sea-air, and is of great benefit to patients suffering from certain diseases of the respiratory organs. Whey is also much employed here, and it is equal to the best prepared in Switzerland. The goats whose milk is used to prepare the whey have been brought here from Appenzell, and they find excellent meadows in the neighbourhood of Kreuznach.

The efficacy of the springs of this place is dependent partly upon their ingredients, and partly upon their temperature. Every spring has its special temperature, which varies from 54° to 86° F.; they are thus suited to different constitutions; the warmer springs are prescribed for delicate persons with increased sensitiveness, and the cooler ones to those who are disposed to congestions. The temperature, however, is of less consequence than the ingredients of the springs, the curative effects of which are especially to be ascribed to the iodine, bromine, and chlorides contained in the water. They exert most influence in cases where pathological productions have to be absorbed and excreted, and in which the general state of nutrition requires a thorough alteration.—*Medical Times and Gazette.*

DANGER ARISING FROM THE EMANATIONS OF PLANTS.

Case 1.—A most singular case of asphyxia has occurred at Lyons. Widow J——, residing in the Rue du Mail, à la Croix-Rousse, bought in the market of St. Jean some apricots for preserving, which she laid out on the floor of her room.

Her son J——, a pattern-drawer, going to his mother's room in the morning, after having knocked, was much surprised at receiving no answer. Suspecting some evil, he burst open the door, and found his mother almost insensible and giving no signs of life. A medical man, who was called in immediately, bled her copiously and she was soon restored. This circumstance is accounted for by the emanations of carbonic acid which had escaped during the night from the apricots which were deposited the evening before on the floor of the room.

Case 2.—A lady, Louise B——, says the *Courier de Lyon,* the wife of one of the principal merchants of our town, had received on her birthday a number of bouquets, which she had had placed in her room by her servant.

The next morning, the latter, wishing some orders from her mistress, found her, on entering her room, in a fainting fit, and almost insensible. Thanks to the skill of one of our best practitioners, who hesitated not to attribute to the odour of the flowers the state of syncope into which she had fallen, Mad. B. was soon restored. Nevertheless, from that time, she has complained of neuralgic pains, which are occasionally intolerable.—*Journal de Chimie Médicale.*

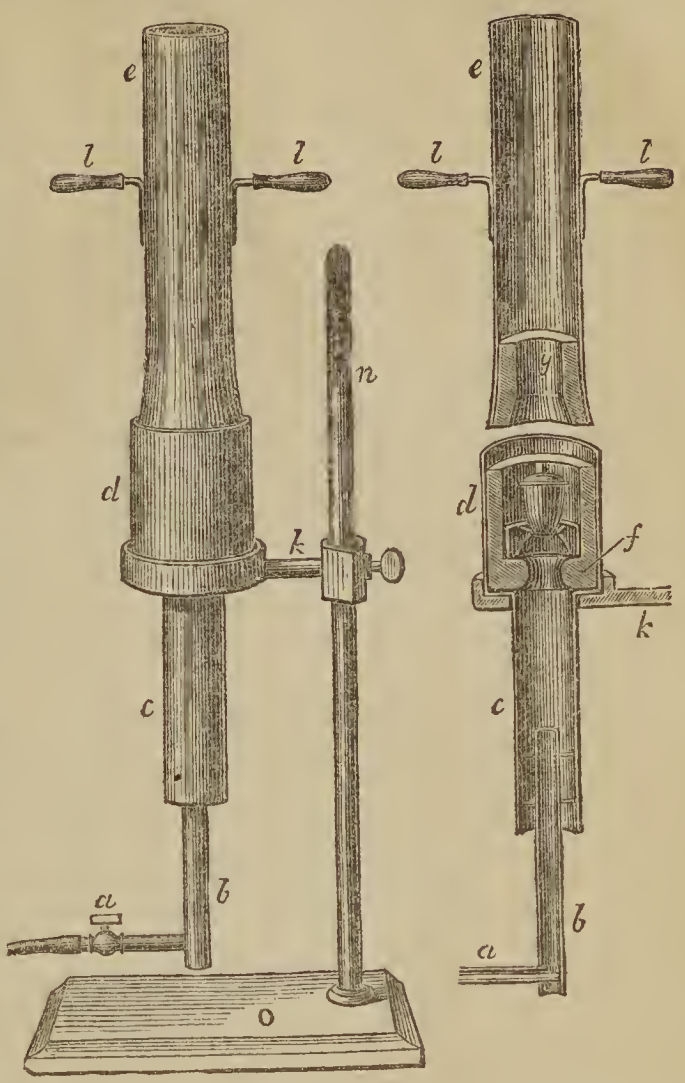
GRIFFIN'S REVERBERATORY GAS FURNACE,

FOR ANALYTICAL OPERATIONS WITH PLATINUM CRUCIBLES.

This apparatus produces a high temperature without the use of a blowing-machine. It is especially suitable for the decomposition of silicious minerals by

fusion with alkaline carbonates in platinum crucibles, being capable of fusing 1000 grains of anhydrous carbonate of soda in ten minutes.

The furnace is represented by the annexed engraving. It consists essentially of a combination of tubes, within which a mixture of coal-gas and air is burnt, and in which a small fire-clay or plumbago furnace holds the crucible in the point of greatest heat.



Letter *a* represents a brass tube and stop-cock of $\frac{1}{4}$ inch bore, for the supply of coal-gas at ordinary pressure. The end of it, fixed within the tube *b*, is pierced with several small holes for the emission of the gas. The brass tube *b* is 9 inches long and 1 inch bore, open at both ends. The iron tube *c* is 8 inches long and $2\frac{1}{4}$ inches diameter, open at both ends, but joined at the top to the iron body of the furnace, *d*. This body is 4 inches high and 4 inches in external diameter. The iron tube *e*, made conical at the lower end, is 15 inches long, $2\frac{3}{4}$ inches wide at the top, and $3\frac{1}{2}$ inches wide at the bottom. The body of the furnace, *d*, is fitted with a lining of fire-clay or plumbago, the upper part of which is cylindrical, with a bore of $2\frac{1}{2}$ inches, and the lower part forms a massive diaphragm, with a central opening of $1\frac{1}{2}$ inches, as shown by *f* in the section. Upon this diaphragm is loosely placed a cast-iron ring with three knife-edges, represented in the section and separately by the figures *h* and *i*, the use of which is to support crucibles. By reversing this ring it can be made to suit crucibles of different sizes. In the lower part of the chimney, *e*, a reverberatory dome of fire-clay or of plumbago is fed. This serves to deflect the flame downwards upon the top of the crucibles. The space provided in the body of the furnace for the reception of crucibles is $2\frac{1}{2}$ inches wide and $2\frac{1}{2}$ inches high, and it will take in a crucible of nearly those dimensions.

The furnace is supported by a flanged iron ring, *k*, attached to a triangular socket, which can be screwed on the $\frac{5}{8}$-inch rod of an ordinary iron retort stand, as represented by *n*, *o*.

The gas, entering the furnace by the supply-pipe, *a*, mixes with the air, which rises through the lower end of the tube *b*, and burns with a smokeless flame when lighted at the upper end of that tube. This flame is then supplied with additional air by the lower end of the tube *c*, a great draught being produced by the action of the tall and wide chimney, *e*. When the pressure of the gas is strong the flame reaches from the tube *b* to the top of the chimney *e*, being in that case two feet long. The point of greatest heat is at 8 or 9 inches above the upper end of the tube *b*, and the arrangement of the furnace is such as to fix the crucible in the focus of the heat. The condition of the crucible can at any time be seen on lifting the dome and chimney *e*, by means of the handles *l*, *l*.

The amount of gas supplied to the furnace is regulated by the stop-cock *a*, from which a flexible pipe should lead to a second stop-cock, attached to a fixed gas-pipe. The latter should be opened wider than is necessary to supply the furnace with gas.

The pressure should then be regulated by the stop-cock *a*. This arrangement prevents, to some extent, the blowing down of the flame when the pressure of the gas in the pipe beyond the fixed stop-cock happens to be suddenly lessened.

RANDOM THOUGHTS ON PHARMACEUTICAL PROGRESS.

BY J. R. COLLINS

"ARE we progressing?" is a question most pertinently asked by your correspondent, Mr. Haselden, in the Journal for April, who modestly hesitates to answer his own question in the affirmative, but suggestively indicates sundry modes of showing progression that have evidently yet to be developed. The question not having been answered, I assume the field to be open to all comers to put in an appearance.

I beg to submit that we are progressing but slowly, if at all, and in this day of almost universal progression, such a position is almost equivalent to retrogression. I mean to say that the position and prospects of the Pharmaceutical Society and Pharmaceutical Chemists is not encouraging. Now for the proof. Admitting all the sentimental advantages gained by our organization so well set forth by your correspondent, what do they all amount to? Is the expenditure and labour of twenty years well paid in that some of our Members are allowed *openly* to assist the College of Physicians in the preparation of *their* Pharmacopœia, instead of *sub rosâ* as heretofore?

Wonderful condescension on the part of the magnates of Pall-Mall East to accept the aid of practical men on subjects that they themselves but imperfectly, because only theoretically, know. After all, the real criterion is the breeches-pocket one. Do Pharmaceutical Chemists and their Assistants get better paid for their services to the public than the Chemists and Druggists of the last generation? I trow not. The writer of this, a few days ago, had an instance of the way in which some of his brethren are contented to be paid for their services. A prescription was presented to his assistant by a lady for a dozen powders, each containing, with other ingredients, one grain of acetate of morphia. These dozen powders were required to be divided into two dozen, and the writer was applied to as to what was to be charged. The prescription being an old one, and bearing evidence of having been compounded at different shops, it was thought advisable to ask what was a very moderate price, viz. 2*s*. for the two dozen powders; but, alas! this was not low enough, for the lady gaped in astonishment at what appeared to her an outrageous demand, never having paid more than 1*s*. for the two dozen powders. The honour of compounding such a prescription at such a price was therefore most respectfully declined. Is the social position of the trade in advance of what it was? I doubt if this query can be answered affirmatively. I am strongly disposed to think that the Chemists and Druggists of the last generation were more liberally educated, and belonged to families of better social position, than those of the present day; and this admits of explanation: larger premiums were required from apprentices, and larger capital was necessary to carry on the business; the trade being regarded as a lucrative one, the children of the more opulent of the middle classes were induced to enter it.

But the rapid rise and progress of the Surgeon Apothecary withdrew in a great measure this class from our ranks, as it was quickly perceived that a better interest was obtained for the money expended on the education of a Surgeon Apothecary than for the capital required for training and starting in business a Chemist and Druggist. But a change for the better appears to be impending; the superior education of medical practitioners, and their improved legal position, render them indisposed to continue their functions as Apothecaries, and when we consider that probably 75 per cent. of the compounded medicines consumed in this country is at present supplied by Apothecaries, we cannot wonder at the depressed condition, as a class, of those who carry on the retail business of Chemist and Druggist. Our policy should be to occupy the ground by anticipation, and endeavour to obtain a legal recognition from the Legislature that the compounders of medicine should be men of liberal education and of approved professional qualifications. If the present system of unrestricted competition be perpetuated, it is hopeless to expect any great amelio-

ration of the condition of the practitioners of Pharmacy. The public should be indoctrinated with the principle that it is *their interest* that the compounders of medicine should be well qualified for their important functions; and when once the public is impressed with this idea, Parliament will embody the sentiment in the statutes of the realm. But to expect that any large number of young men will be at the trouble and expense of an improved education without the stimulus of self-interest, is to ignore one of the deepest springs of our nature.

As a member of a metropolitan vestry, the writer induced his colleagues, on a recent occasion, to require that candidates for the appointment of dispenser (of which office the board had the patronage) to a large parochial infirmary should have passed the minor examination of the Pharmaceutical Society. An advertisement was inserted in the Journal inviting candidates, the salary being £80 per annum, with only six hours' work per diem—from 10 till 4.

The remuneration is quite equal to the average pay of assistants, and the hours of labour less than one half, but there were only four qualified applicants; many more applied not having passed the examination, but by the terms of the competition were excluded. The writer must confess to some mortification at this result, which scarcely justified his recommendation, and what was worse, some of the unqualified candidates appeared to be the best qualified for the situation. The Pharmacy Act must be regarded as a failure, being simply of a permissive character; and it is much to be regretted that the ever to be lamented Jacob Bell accepted legislation of such a milk-and-water character. He was actuated by lofty aspirations, a noble ambition influencing him; but, alas! mankind in the gross is only excited to exertion by the powerful motive of present advantage, justifying the Napoleonic axiom that the "belly rules the world." The Council of the Society is very commonly held responsible for the slow progress of our cause, but this is not just; as is the Society so will be the Council.

Administrative bodies, moreover, are always conservative rather than aggressive; and the Council of the Society, composed as it is mainly of the magnates of the trade, well satisfied with their own condition, can scarcely be expected to be restlessly alive to the wants of their poorer brethren.

The maintenance of the Society as an institution is their principal care, and in resisting attacks from without the Council has well performed its functions. One word as to the benevolent fund: the average income of Chemists and Druggists has been stated on good authority not to exceed £200 per annum; what margin can a man with a family and such an income have for benevolence? He may have the divine virtue in his heart, but with the claims of modern society he is clearly more likely to require benevolence than able to exercise it with offerings of yellow gold.

After this jeremiad I must indulge in one note of laudation. Pharmacy, as an art, has advanced and is advancing; let us hope that with all our defects this merit will at length be fully recognized, and if we could only induce amongst ourselves something like an *esprit de corps*, having a just appreciation of our responsibilities and what is due to us, instead of the insane competition and jealousy that too often prevail, I should be sanguine that the present generation would be able to say, and that with truth, that the latter days are better than the former.

Haverstock Hill, 15*th April*, 1861.

THE BRIGHTON CHEMISTS' ASSOCIATION.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—Whilst a local institution may have a special interest to the town and neighbourhood where it is formed, it is nevertheless exercising a *general* influence on the status of the trade or profession which it purports to represent. With these views I have pleasure in furnishing you with the following particulars:—

For two years efforts have been made to bring the Chemists of Brighton together for a social excursion in the country, and this year it was thought desirable to institute something more intellectual; and after the necessary preliminary meeting,

and an individual visit to each establishment in the town, thirty-four Members enrolled themselves, or permitted their names to become enrolled, as "The Brighton Chemists' Association," having for its objects "the mutual improvement and general advancement of the interests of the body." The rules have been formed, and Lewes and Worthing invited to co-operate. One from the latter town is all as yet that has recognized the Association. The first meeting for the election of officers took place on April 12th, Mr. T. A. Brew in the chair, when that gentleman was elected President for the year, and Mr. J. T. Gwatkin, Honorary Secretary; the Committee to consist of Messrs. Breton, Cornish, Glaisyer, Noakes, Savage, and Schweitzer. The constitution of the Society is of the broadest character, admitting all that are now in the trade, by paying in advance 10*s.* per annum; Assistants and Apprentices of Members, 5*s.* each. I trust that a long and prosperous career is before us, and that much good will follow our efforts.—I am, Sir,

ONE OF THE PROMOTERS.

THE VARIABLE SIZE OF TEASPOONS.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

SIR,—While suggestions are emanating from eminent persons among us as to the best means of preparing ointments, &c., will you allow me to call attention to a matter which I think you will deem certainly of equal importance, not only to ourselves but to the public. A person called at my shop a few days since, and produced a two-ounce bottle which had contained certain drops prepared from a prescription. Inquiry had been made of the chemist as to how many doses the bottle contained, and the reply was about sixteen, a teaspoonful being ordered three times a day; "but," continued the party, "I have taken only *nine* doses, and the bottle is empty." Is it not time that a better system was adopted of giving instructions, since a teaspoonful has become such an indefinite quantity?

I measured the bottle and found it held exactly two ounces. If morphia or any potent preparation be ordered, ought it not to be the care of the prescriber to have it dispensed in graduated bottles, in order that the patient should take one dose and not *two* at a time?

Our teaspoons are certainly nearly double the size of those with which our great-grandmothers did their dispensing.

I am, Sir, yours, truly,

25, *Worcester Street, Birmingham.* THOS. FARDON.

[In all cases where active remedies are prescribed in teaspoonful doses, it is better to instruct the patient to take ʒj. by measure, and thus avoid the inconvenience alluded to by our correspondent.]

SUSPECTED POISONING BY ARSENIC.

ON Monday, April 22nd, an inquest was held at Carlisle, before Mr. Carrick, coroner, on the bodies of William Horsley, aged 23, and his mother-in-law, Jane Davidson, aged 49, who died on Friday, April 12th. The following are the principal facts of the case:—Horsley had been married to a daughter of Jane Davidson, but his wife had died eighteen months ago. He was in the habit of visiting the Packhorse, a public-house kept by the woman Davidson, who appears to have become enamoured of her son-in-law, but was jealous of his attentions to a young woman; and according to one of the witnesses, Esther Short, she had consulted a fortune-teller, and had asked witness to go to a druggist, and get her some "dragon's blood," which was to be burnt in the fire as a charm to prevent her son-in-law from keeping company with her rival. On Thursday, April 11th, Horsley went to the Packhorse, and in the morning was found lying on the "settle," dead. Blood had been flowing from his nose, and the collar and necktie were so tight that a white ring was formed round the neck, with a purple mark above and below. In the

mean time the woman Davidson was very ill, having had frequent vomiting during the night, and these continued at intervals during the day until the afternoon, when she died.

William Whitehead stated that Mrs. Davidson had asked him to procure some strychnine for her to "cure the rats." She afterwards gave him a shilling to get the strychnine, and said, "Will you swear you will not mention it to any one?" Witness assented. She replied, "Well, I must tell you the truth, it is for Horsley." Witness did not get the strychnine, but spent the shilling with a friend at a public-house.

The medical men who made the *post-mortem* examination of the bodies stated that they found large quantities of arsenic in the body of the woman, but, as the analysis in the case of Horsley was not completed, the inquiry was adjourned till the 2nd of May.

MISCELLANEA.

Method of Preserving Cut Flowers.—Most persons are fond of preserving bouquets of natural flowers. Many methods of preservation have been proposed, but they have all more or less failed; the water in which they are placed becomes tainted, and is obliged to be changed at least once or twice a day, but even then the decay of the flowers, which begins very soon after their separation from the plant, is not materially prevented. The following method, which has completely succeeded, consists in putting a table-spoonful of powdered charcoal into the vase which contains the water destined to receive the flower or cut spray, and carefully placing the latter so that their lower extremities are beneath the liquid. This method has produced the most favourable results, for flowers may be thus preserved without any visible alteration—at least as long a time as in their natural condition—without the necessity of renewing the water or the charcoal.—*Mémorial des Pyrénées*, and *Journal de Chimie Médicale.*

A New Colour—Indian Red.—Take sandal wood in powder, and exhaust it completely by alcohol. In the alcoholic solution thus obtained, pour hydrated oxide of lead in excess. Collect the precipitate on a filter, now wash the precipitate with alcohol, and dry it; dissolve it in acetic acid, and to this acetic solution add an excess of water. The colouring matter which, is insoluble in water, is precipitated, and the acetate of lead remains in the solution, and may be used to make new oxide of lead. Wash the precipitate well, and dry it at a low temperature.—*Prof. H. Dussance* in *Chemical News.*

Poisoning by Wild Parsnips.—At Allerston, a village on the Yorkshire Moors, five children, four of one family, named Hicks, and a fifth named Jones, were playing in a garden, where they found what they thought to be a bed of carrots, and they all ate freely of the roots. They were subsequently seized with sickness, and exhibited all the symptoms of poison. One of the children, five years old, died; the others, by the use of antidotes, recovered. An inquest has been held, and it was ascertained that the supposed carrots were wild parsnips, the seed of which was purchased and sown for carrots, the white variety of which the roots somewhat resembled. The jury returned a verdict that the deceased was poisoned by eating wild parsnips.

Suicide by Cyanide of Potassium.—An inquest has been held at the Bear Hotel, Sudbury, on the body of Daniel R. Foy, of 10, Lansdowne Road North, London. It appeared from the evidence that the deceased, who was a married man, had conceived a strong attachment to a young woman who had lived with him as a servant, and had followed her into the country. He proceeded to the Bear Hotel, Sudbury, where he wrote her a letter stating that he had left his wife, and had thrown up an engagement of £180 a year. On the following morning he was found dead in his bedroom, and a letter by his side addressed to the landlord, to the effect that he had swallowed cyanide of potassium. The jury returned a verdict that the deceased had poisoned himself, but gave no opinion as to the state of his mind.

Accidental Poisoning by Chloride of Zinc.—An inquest has been held at the Camden's Head, Bethnal Green Road, on the body of Mr. John Samuel Ames, an undertaker. It appeared from the evidence that the deceased, who was engaged at a funeral, took from the sideboard a bottle which was supposed to contain gin, and poured out half a glass of its contents. He drank a portion of it and handed the rest to the men, who, after tasting it, became sick. The deceased was seen by a surgeon, who administered antidotes, but without success. It was proved that the bottle was labelled "Chloride of Zinc." The jury returned a verdict that "The deceased died from inflammation of the stomach, caused by swallowing by mistake a certain poison known as disinfecting fluid."

[A correspondent, referring to the above case, recommends manganese as an antidote in cases of poisoning by chloride of zinc.]

Suicide by Laudanum.—Mr. Richard Steevington, aged 42, of the London Road, Southwark, committed suicide by taking laudanum. It was stated that he had been in a very low and desponding state of mind. One of the inmates, on going into his room, found him in a state of insensibility, with a phial lying by his side that had contained laudanum. He was taken to Guy's Hospital, where every means for the purpose of restoring animation were used, but he gradually sank and expired from the effects of the poison.

BOOKS RECEIVED.

Transactions of the Medical and Physical Society of Bombay, for the Year 1859. Bombay: 1860.

Remarks on the Topography and Diseases of the Gold Coast. By R. Clarke, Esq. Read before the Epidemiological Society, May 7, 1860.) From the Author.

TO CORRESPONDENTS.

Juvenis (Slough).—The dried specimens of plants forwarded for competition for the botanical prizes must be arranged according to the Natural System.

H. P. (Carlisle).—(1.) Moore's *British Ferns*, price 7*s.* 6*d.* (Routledge). (2.) The specimens must be obtained from wild plants. (3.) Any indigenous plants, whether medicinal or otherwise, may be collected. See also Regulations for the Botanical Prize for 1862, in the April number of the *Pharmaceutical Journal* for the present year. (4 & 5.) See Regulations of the Board of Examiners in the March number of the *Pharmaceutical Journal* for the present year.

An Associate (Manchester), and other correspondents.—Bentley's *Manual of Botany* will be published in a complete state by the first of May.

F. E. M.—(1.) No authorized formula. See vol. i., second series, page 200. (2.) *Syrupus Sarsæ Comp.* Vol. ii., page 215, and vol. iii., page 250. (3.) Ten ounces.

Alembic.—(1.) *Linimentum Iodinii cum Opio:*—

℞ Tincturæ Iodinii Compositæ, ℥j.
Tincturæ Opii, ℥j. Misce.
Skin Hospital Pharmacopœia.

(2.) The eighth of a grain.

"*Alpha*" (Worcester).—A little French polish will answer the purpose.

J. A. B.—Parnell's *Elements of Chemical Analysis.*

A Junior (Rugby).—(1.) Persons not belonging to the Pharmaceutical Society may have the Journal forwarded regularly by application, in the usual manner, to Mr. Churchill, 11, New Burlington Street. (2.) No.

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, Elias Bremridge, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. Churchill, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

THE PHARMACEUTICAL JOURNAL.

SECOND SERIES.

VOL. II.—No. XII.—JUNE 1st, 1861.

THE COLLEGE OF PHYSICIANS AND GENERAL PRACTITIONERS.

About twelve months ago the College of Physicians, by an alteration of their bye-laws, provided for the admission of a new class of medical men, under the denomination of Licentiates of the College of Physicians. These Licentiates are designed to occupy a position, in regard to the nature of their practice, similar to that of the Apothecary or General Practitioner, with this important distinction, however, that they are restricted from the sale of drugs and from supplying medicines to any others than their own patients. It was seen that the practical operation of this arrangement would be at once to divert, to some extent, the application for licenses from Apothecaries' Hall to the College of Physicians, and ultimately to effect a great change in the character and position of a large proportion of the General Practitioners throughout the country, by causing a more complete separation than has hitherto existed of the practice of physic from the dispensing and sale of medicines. This change was not likely to be brought about without some opposition from the Apothecaries' Company. No sooner was the new regulation put into force than it became obvious that a trial of strength must take place in the law courts, as well as in public opinion, between the two corporations who claimed the right of licensing General Practitioners. The Apothecaries' Company consider that they alone are authorized by law to license medical men who are at once prescribers and dispensers of medicine. For forty-five years they have maintained the undisputed exercise of this power, and it cannot be denied that they have well performed the important duty committed to them in 1815. On the other hand, it is contended by the advocates of the new system, that the fact of the Apothecaries' Company being a trading corporation, exerts a prejudicial influence upon the professional character and position of those who become connected with them as licensed Apothecaries. This connexion serves to encourage the disposition to trading in those who should take a more purely professional position, and by causing many Apothecaries to become half Druggists, it proves injurious to the medical profession, inducing a retaliation from those who being educated merely as Druggists, become half Apothecaries. While Apothecaries continue to keep open shops, a large proportion of the public will not fail to identify the coloured bottles in the window with the qualification to practise medicine. This is admitted by all to be an evil; and if the transference of the licensing of General Practitioners to the College of Physicians will to any extent prove a remedy, it is one which all must desire to see carried into effect. We insert in another part of this number a report of the judgment delivered by Vice-Chancellor Wood, on the information filed by the Apothecaries' Company to restrain the College of Physicians from granting the licenses in question, and this is so decidedly in favour of the College, that it does not seem likely any further opposition will be made to their proceedings.

TRANSACTIONS

OF

THE PHARMACEUTICAL SOCIETY.

AT A MEETING OF THE COUNCIL, 1*st May*, 1861,

Present—Messrs. Bird, Brady, Bucklee, Deane, Edwards, Hanbury, Haselden, Hills, Lescher, Meggeson, Morson, Sandford, Squire, and Waugh,

Mr. James Bates .....Wellington, was elected a

MEMBER.

MEETING OF COUNCIL, 15*th May*, 1861,

Present—Messrs. Bird, Bottle, Bucklee, Deane, Edwards, Hanbury, Haselden, Herring, Hills, Hollier, Lescher, Mackay, Meggeson, Morson, Sandford, Squire, Standring, and Waugh.

CONVERSAZIONE.

The invitations issued by the President, Vice-President, and Council, for the usual Annual Conversazione on the 14th of May, the day preceding the Anniversary Meeting of the Society, were responded to on this occasion by an unusually large number of visitors, amounting to upwards of one thousand. For the reception of this large assembly nearly the whole of the extensive premises now occupied by the Society was thrown open, including the lecture-hall and the laboratories; and objects of general and scientific interest in great variety were provided by the kind assistance of friends, many of whom have on former occasions contributed in a similar manner. On the walls of the principal rooms were a number of valuable and interesting pictures, mostly by British artists of eminence, but some also by Persian and Chinese artists. These were lent by Mr. Dillon, Mr. J. Morley, Messrs. Vokins, Mr. Porrett, Dr. Daniell, and Mr. T. Morson, jun. The Chinese drawings related to incidents connected with the late English and French campaign in China, and especially the entrance of the troops into Pekin. One of the rooms was decorated with ancient armour and objects of antiquarian interest obtained from a great number of contributors, including Mr. Porrett, Mr. Dillon, Mr. Wyburd, Mr. Holtzapffel, and Mr. Robert Morson, and very tastefully and appropriately arranged by the two last-named gentlemen. In this room there was also a very beautiful helmet made of the new metal aluminium, an application which has been indicated as one of those for which the metal, on account of its extreme lightness, is well adapted. There were several articles of the same metal, making altogether a superb display, and furnished by Messrs. Bell, the manufacturers, of Newcastle. One of Holtzapffel's very highly finished lathes with all the modern improvements; and instruments for taking minute measurements, were greatly admired as specimens of exquisite workmanship. Among works of art which attracted a good deal of notice must be mentioned three busts, representing Charles Kemble, Mr. Bazalgette, the civil engineer, and a lady, by Mr. Timothy Butler; a number of very beautiful bronzes from Messrs. Jackson and Graham; specimens of electro-plated articles of superior workmanship and design from Messrs. Collis, of Regent Street; specimens illustrating modern improvements in glass manufacture from Messrs. Powell and Sons; also articles in or-molu and china from Mr. W. S. Burton and Messrs. Phillips, of Oxford Street.

Among objects of scientific attraction, a prominent place was occupied by an exhibition of enlarged transparent photographs on glass, representing the successive phenomena observed during the occurrence of the total eclipse

of the sun last year, as seen in Spain. This very interesting series of representations was contributed by Dr. Warren De la Rue (who formed part of the scientific commission who visited Spain to observe the eclipse), under whose management the photographic department was placed. Mr. Spiller, chemical assistant in the chemical department of the Royal Arsenal at Woolwich, also exhibited a series of photographic representations of the sun, taken on the same occasion in this country by himself and Mr. Crookes. The Private Telegraph Company had some of their instruments at work throughout the evening, and their mode of action was explained to a constant succession of eager inquirers. These instruments are now being introduced for the use of merchants, bankers, stock-brokers, and others, who frequently have occasion to communicate with some establishment at a distance. Thus, for instance, the merchant in his counting-house wants to send a message to his warehouse or factory, which may be some miles off, and he does so by means of this telegraph, which is one of Wheatstone's modern inventions. It is so constructed that any person, without practice, can use it with facility; and it does not involve the use of a galvanic battery, the current of electricity being produced by revolving a permanent magnet. The part of the instrument by means of which messages are given and received resembles in appearance the face of a watch, on which the letters of the alphabet are arranged in place of the hours, and the hand or index is made to point to any of these by depressing the key attached to each letter. Words are thus spelt by touching the keys with the finger, the same indications being simultaneously afforded at both extremities of the line of wire. To facilitate the use of these telegraphs the company have bundles of wires, each bundle containing fifty or sixty separately insulated wires, which are conveyed over the tops of the houses in the directions in which they are most likely to be required, and any person can rent one of these wires. Thus, a tradesman in the City, who has a branch establishment at the west end of the town, having a wire terminating at each place, can send messages to and fro as rapidly as they could be written on paper; and banks having branch establishments are in like manner brought into communication. It must be admitted, however, that the thick bundles of wires connected with this arrangement, which, together with the many other aërial telegraph wires, begin to cover London like a great spider's web, do not improve the appearance of our city.

Mr. Joubert exhibited some specimens, illustrating the application of his process for fixing photographic pictures on glass. In this process the pictures are burnt in, so that they become quite permanent and indestructible under ordinary use. They form very beautiful transparencies.

There were several instruments for exhibiting in different ways the phenomena connected with the subject of spectrum analysis, which has recently attracted so much attention among chemists and physicists. These were exhibited by Mr. Ladd and Messrs. Horne and Thornthwaite. The subject is described in recent numbers of this journal, at pages 324 and 573 of the present volume. Some of the effects were shown by Mr. Ladd with the electric light reflected on a screen. The oxyhydrogen microscope was also employed to show some beautiful transparent photographs of views in Java, taken by Messrs. Negretti and Zambra.

While these two latter exhibitions engaged the attention of part of the company in the lecture-hall, Mr. Way's mercurial electric light formed an object of great attraction in the laboratories at the top of the building. It was here kept in action throughout the evening, casting its livid light upon the countenances of the surrounding spectators, and producing in this way the most extraordinary but by no means pleasing effect. The light is produced by the ignition of a thin stream of mercury passing from a small jet to a cup

beneath, and forming the connecting link between the poles of a powerful galvanic battery. The ignition of the mercury is effected within a glass cylinder in which the vapour is confined, and condensed on the surface of the glass. This method of producing the light is considered to possess advantages in some respects over the use of charcoal points, when applied to lighthouses, or for other similar purposes, in which the quantity of light and not its purity is the chief consideration.

Mr. Griffin's gas blast furnace came in for a share of attention in the laboratories in the early part of the evening, at which time it was put into operation, and by means of it twenty-one pounds of cast-iron were melted in one hour and twenty minutes. Several other forms of apparatus for the application of coal gas in chemical operations were exhibited by Mr. Griffin, as well as chemical apparatus generally by him, and by Messrs. Jackson and Townsend.

Messrs. Elliot Brothers exhibited Bridge's Diffraction Apparatus for the production of a great varicty of beautifully-coloured patterns produced by the diffraction of a small beam of light passing through apertures of different forms. The instrument is generally used in bright sun light, but on this occasion the oxyhydrogen lime light was employed.

There was a good array of microscopes, including the binocular microscope, with many interesting objects, exhibited by Messrs. Smith and Beck, Mr. Ross, Mr. Pillischer, Messrs. Horne and Thornthwaite, &c.

Dr. Bowerbank excited much interest by his description of the structure of sponges, illustrated with the microscope. He also contributed several other objects of interest, including a fossil turtle dug out of the London clay, and a large piece of fossil Cycas, with a model of the fruit of the same.

A very powerful electrical machine, the plate and insulating parts of which were made of ebonite, also numerous other articles made of the same material, were exhibited by Mr. Silver, of Gracechurch Street.

Mr. Knight, of Foster Lane, contributed some photographs, a magneto-electric machine, &c.

Professor Abel's fusees, and the apparatus recently constructed by this gentleman and Professor Wheatstone for the explosion of gunpowder by electricity, were exhibited, together with a series of photographs representing the results of experiments made in the destruction of a martello tower at Eastbourne with an Armstrong gun, for which, and also for a fine specimen of crystallized lead, the Council were indebted to Professor Abel.

Dr. Daniell contributed several interesting objects, in addition to the pictures already alluded to, which he has recently brought from China.

One of the large reception-rooms was chiefly devoted to the exhibition of chemical, pharmaceutical, and botanical specimens. Among these there was a collection of iron ores and other minerals from Professor Tennant. A splendid collection of specimens of platinum and silver in different forms and combinations from Messrs. Johnson and Matthey, of Hatton Garden. Very fine specimens of crystallized iodide of potassium and sublimed iodine from Mr. Huskisson. Some fine groups of crystals of bichromate of potash and sulphate of copper, platinum wire gauze, tough lunar caustic points, and several minerals and metallic compounds, from Messrs. Johnson and Sons, of Basinghall Street. A fine specimen of crystallized benzoate of ammonia and a specimen of iodide of tetramethylammonium from Dr. W. Squire. Fine specimens of Canadian castor, benzoin, myrrh, guaiacum, and cinchona bark, from Messrs. Battley and Watts. A remarkably large and fine piece of rhubarb from Mr. Foulger. Some square cakes of benzoin, recently imported and cut open to show the manner in which very inferior resin had been introduced into the mass where it was least likely to be observed, from Messrs. McCulloch and Squire. A urinary cabinet

from Mr. Brewer. Smelling salts and coloured oil from Mr. Allchin. Gluten bread from Mr. G. Van Abbott, of 3, Cannon Street. A seltzine apparatus, consisting of a double bottle, in the two compartments of which the acid and alkali are respectively dissolved, and from which the solutions are simultaneously poured into a glass, from Mr. James Boyd. A similar apparatus made of earthenware from Messrs. Morgan Brothers. New ear douche and eye douche from Messrs. Savory and Moore. English and Italian pharmaceutical jars of the 17th and 18th centuries; old pharmaceutical glass bottles and box; brass mortar and pestle from Erzeroum, in Armenia; modern glass phials manufactured at Hebron, Palestine, and sold at Jerusalem in 1860; apparatus and articles illustrating Chinese pharmacy, from Mr. D. Hanbury. Specimen of artificial fruit ethers from Mr. Bush. Glass casks from Mr. Moreau. Veneered corks from Mr. Seithen. Dispensing shop bottles, illustrating some suggestions for labelling with a view to the prevention of accidents, from Mr. T. H. Hills. Drawings of some of the old pharmaceutical laboratories of London, including those of Messrs. Allen, Hanbury, and Co., Messrs. J. Bell and Co., Mr. Battley, and Mr. Morson.

Among the botanical specimens, Mr. Alfred Smee exhibited a balsam of Peru plant which he had raised from seed supplied to him by Mr. Hanbury. There were also a large number of medicinal and economic plants in pots, which had been supplied by the Royal Botanic Society in the Regent's Park; also a collection of models of Fungi from Dr. Percy.

The following have also to be acknowledged:—Specimens of New Zealand iron sand, and Taranaki steel prepared from it, from Messrs. Moseley. This iron sand has for some time past attracted the attention of scientific and practical men, partly on account of its being found to contain a considerable quantity of oxide of titanium. The sand is strongly attracted by the magnet, and consists almost wholly of oxides of iron and titanium. It is found along the shores of New Plymouth, in Taranaki, New Zealand.

Specimens illustrating the application of mica for the production of printed transparencies from Dr. Leiss. Specimen of silicious stone from Surrey, yielding 60 per cent. of silica to alkaline solution, from Professor Way. Specimens showing the commercial products from the potato; a cross-bow and arrows of the Tartar long-bowmen, from the Taku forts, Peiho river, and other objects, from Mr. P. L. Simmonds. Deep sea sounding apparatus from Dr. Wallich. Specimens illustrating the manufacture of paraffin and paraffin oils from Mr. C. Tomlinson. The stereotrope from Mr. Shaw. Select specimens of fibres from Mr. M. C. Cooke. Stereoscopes and photographs from Messrs. Murray and Heath. Stereoscope, with a set of revolving views, taken in Java, from Messrs. Negretti and Zambra. Fine specimens of preserved grasses, tastefully arranged on cardboard, from Mr. Charles McCulloch. An extensive series of British ferns and sea-weeds, very beautifully preserved and arranged, from Mr. Jardine. Models of crystals from Mr. Larkin. Polarizing apparatus from Mr. Darker and Mr. Bestall. A large selection of crucibles, muffles, and furnaces, made by the Patent Plumbago Crucible Company. Some of Dahlke's patent filters, Slugg's druggists' microscope, and a variety of articles, from Messrs. Morgan Brothers. A patented improved Davy's safety lamp from Mr. E. C. Crawley. Specimens of poison bottles from Mr. Toogood.

Mr. Coffey occupied one of the laboratories in the exhibition of apparatus for pharmaceutical purposes, including his esculapian still, apparatus for evaporating at low temperatures, patent boiling apparatus, syphons, hydraulic press, &c.

TWENTIETH ANNIVERSARY OF THE PHARMACEUTICAL SOCIETY.

Wednesday, May 15th, 1861.

MR. T. N. R. MORSON, PRESIDENT, IN THE CHAIR.

The PRESIDENT opened the Meeting with the following address :—

GENTLEMEN,—When I last addressed you from this chair I had no intention or expectation of continuing to hold the office of your President, but having been again selected by the Council, I could not well refuse the honour conferred upon me in the then state of our house and of the works which were in progress here; although I felt, and still feel, my inability to devote sufficient time and attention to the various important objects and operations of the Society. It must be obvious to you all, that to follow in the track of our late lamented President, who devoted not only the greater part of his time, but also no small share of his wealth, to the carrying out of the objects for which he had founded this Society—for he, in truth, was the founder of it—is possible only to very few Members of our body, requiring, as it does, much leisure and energy, with regard to which I feel my own deficiency. Endeavouring, however, to act upon the principles so strongly advocated and successfully applied by our lamented friend, Jacob Bell, I have arrived, I trust not unsatisfactorily, at the end of my term of office, which expires with this short address.

Taking a retrospective view of the Society from its foundation, most persons have been astonished at the rapid progress it has made, and the position it has attained in so short a time, due for the most part to the untiring energy and zeal of a few individuals, but principally of one gentleman. It must not be forgotten, however, that trees of rapid growth require much care and attention to give them strength and stability; and this is equally the case with Societies, the power and influence of which depend in great measure upon numerical strength, and the general interest maintained in their proceedings.

Previously to the establishment of this Society the body of Chemists and Druggists of Great Britain could be regarded as little else than a body of traders, most of them on a small scale, with a few very remarkable exceptions, and these exceptions chiefly based upon the introduction of some scientific element, or, at least, the pretension to it; and it is curious and important to observe how durable the influence of this element has proved, whether used for legitimate objects, or to give effect to gigantic and most successful quackery, if the realization of wealth be rightly regarded as success. It would now be difficult to name a town of any considerable extent that cannot boast of its Pharmaceutical Chemists, and in very many instances among these, I am happy to say, certificates of examination afford evidence that some amount of scientific study has been applied in laying the foundation for a sound professional qualification. Every year will add to the number of these, and before very many years have passed we may expect to find wholly uneducated men rare exceptions, and that in a country where free trade in all things is admired and permitted.

One of the great objects which Mr. Jacob Bell early and most anxiously sought to attain, was to bring together all the respectable members of our body so as to form the foundation of his edifice, but great difficulties were experienced with many who could only be induced to look at the immediate profit-and-loss view of the matter, and with this class protection from some real or apprehended evil, and not science, was the point upon which the most successful argument could be founded. Time, however, which in its progress enlightens most men, is gradually, but firmly, convincing them that connexion, however slight, with the higher objects of a great Society is likely to prove a source of profit, by giving tone and respectability to the holders. It is therefore to be desired that men of this class, whose age, respectability, and long connexion with the trade, ought to have ensured their being numbered with the founders of this Society, should be

now brought into union with us. I believe that some of these gentlemen were originally deterred from joining the Society, not certainly by any want of qualification, but probably by a sort of conservative feeling which kept them aloof from the more active spirits of the day. It is satisfactory to find that now the desire to unite and co-operate is mutual. The proposal made to open again the doors of the Society to men of this class, has given alarm to some of the most zealous of the supporters of education among us, and has also been viewed as an act of injustice to our original and also to examined Members, but I have no fear that under the proposed arrangement the Council would admit to membership any persons who would reflect discredit upon the body, or who could not have claimed admission equally with ourselves had we obtained a compulsory Act of Parliament. With regard to the objection raised by examined Members, I would say, let them rely on their Certificate of Examination, and display that, instead of the very pretty picture which the other Members have to show, which is valuable only as indicating that Englishmen can make sacrifices for the common good, and that the zeal which led to the founding of our great city companies is not extinct in Great Britain.

It has been stated by superficial observers that we have been too lavish in our expenditure. Certain it is that we have spent much, and I hope we shall be enabled to spend more ; but I am proud to say that we have touched nothing but the reserve fund set aside for such legitimate use as I believe we have now made of it. We have incurred no debts that we cannot fully pay, and with vastly increased accommodation and advantages, have rather a diminution than augmentation of annual outlay. Why then, it may be asked, do we desire to open the doors for the admission of new Members? Is it our poverty that induces us to do so ? I trust not, for although the increase of income will be most useful to us, yet what we much more desire is, that there should be no outsiders who ought long since to have aided the cause in which we are engaged. It is with this object principally, and also to provide for the permanent maintenance of the institution by which the important object of advancing the art and science of Pharmacy will be, as it has been, mainly effected in this country, that it is proposed to revise, and in some respects to alter, our bye-laws. It must not be forgotten that abroad, in France and Germany, institutions similar to ours are supported by the State, and under Government direction—an arrangement which, in this country, would not be considered to be a good unalloyed with evil.

As a further answer to the question, "Are we progressing?" I would refer the querist to the present state of our examination arrangements, for which we are greatly indebted to our Vice-President and the Examiners generally, who have devoted unwearied attention to the duties relating to this important department. I can assure the Members, that whilst ample justice is done to the youthful candidates who present themselves for examination, certificates are not granted to the incompetent, and as far as examination can be a test of ability and merit, the certificates granted by our Board may be relied upon as a guarantee for professional qualification. It cannot, however, be supposed that men of long standing in the business, however well qualified, would readily submit themselves to this test, neither could we in justice call upon them to do so.

If the question were put to me, "In what respect are we not progressing?" I should answer, in the advancement of the science of Pharmacy. I regret to say, that little has been done in this respect during the past year, either in this or in any other country. It appears to me that we are doing too much in the wrong direction, by the introduction of complex and ill-defined mixtures of powerful or doubtful remedies, which are forced upon the attention of medical men and the public by a system of advertising, which certainly does not speak well for the existing state of Pharmacy among us. What advantage can possibly result from the combination of lime, iron, manganese, &c. &c., in impossible

quantities with pyro- and hypo-phosphoric acids and sugar, &c.; or from the admixture of strychnine with pepsine, or with citrate of iron and ammonia? Such remedies as strychnine should surely be administered in the simplest forms, and not combined with popular medicines. The introduction of such compounds, the composition of which is not clearly defined, and often not fully known to those who prescribe them, must often be fraught with danger, and always of doubtful utility. It is to the adoption by the regular practitioner of such complex Pharmacy that the homœopathists are indebted for half their success, and vantage ground is thus given to the opponents of allopathy. Surely there is much matter here for serious consideration, and an ample field for important improvements. I have been asked how it is that such preparations become popular with medical men, and I must confess that I am unable to answer the question. It proves, however, how great the influence is which may be exerted by a well devised and sustained system of advertisements, not only upon the public mind, but also upon the professional mind; nevertheless, it is humiliating to science.

It has been asked, What is the use of science to those of our Members who combine the sale of many other articles with that of drugs, and who of necessity carry on a general rather than a purely pharmaceutical trade? I answer, of great use. A good knowledge, and a scientific knowledge in such, with regard to tea, to sugars, to colours, to oils and sponges, and even to textile fabrics, must give to the possessor a great advantage, if he only knows how to use it; and if such knowledge should unfit him for business, I think there must be something wrong in the essential qualities of his mind.

And now, gentlemen, to turn to other subjects. It will be asked why the arrangements connected with the Bell Memorial Scholarships have not been announced, or some indication given of progress being made with reference to this undertaking? I may state, in reply to such inquiry, that the subscriptions have not been entirely collected, and that the details relating to the appropriation of this fund, which may at first sight appear simple, have occupied much time and consideration. The deed is now prepared, and an application of the fund will no doubt be made during the ensuing session.

The arrangements for the appointment of Local Secretaries have been under the consideration of the Council, and they are anxious to commend this subject to the attention of Country Members, who ought to be the best judges of fitness for the office. It is of great importance to the well-being of the Society that these officers should be well selected, having the confidence of their professional brethren, and being prepared to make some sacrifice of time in carrying out the objects of our Association.

In the distribution of the Benevolent Fund some painful cases occasionally occur, in which the Council find themselves unable to confer relief where it appears to be most urgently required, in consequence of the restrictions imposed upon the distribution of the fund by the provisions of the Charter, which cannot be altered. One of these provisions is to the effect that the Fund shall be applied only for the relief of distressed Members, while it often happens that the very pressure of distress may have deprived a Member of the means of continuing his connexion with the Society, and at the same time of his claim for relief from the Benevolent Fund, under the restriction adverted to. It is a question whether an additional fund might not be established in connexion with the Society for the relief of such cases. I offer this as a hint for further consideration.

Since the last anniversary meeting we have sustained a great loss in the death of Mr. Macfarlan, who so ably represented North Britain in the Council. His great attainments, and the high respect in which he was held by all who knew him, will cause his loss to be felt by a large circle of friends. An active Member of the Society, the Local Secretary for Edinburgh, was, in accordance with the

bye-laws, appointed by the Council to fill the vacant place at the Council Board, and this gentleman is now a candidate for re-election.

The SECRETARY then read the

REPORT OF THE COUNCIL.

FINANCIAL STATEMENT—*From 1st January, to 31st December*, 1860.

RECEIPTS.	£	s.	d.
Balance in Treasurer's Hands	89	5	7
Life Members' Fund:			
Fees 147 0 0			
Interest 49 8 9			
	196	8	9
Benevolent Fund:			
Subscriptions 49 11 0			
Interest 153 19 7			
	203	10	7
Government Securities, Interest ...	194	5	11
Legacy, per Executors of the late Jacob Bell	2000	0	0
Proceeds of Sale of £5108 0 9 Stock	4694	18	10
Rent	151	0	0
Fees:			
37 Pharmaceutical Chemists 207 18 0			
59 Assistants 238 7 0			
80 Apprentices 168 0 0			
	614	5	0
Subscriptions:			
363 London Members ... 381 3 0			
1561 Country Members ... 1639 1 0			
130 Associates 68 5 0			
53 Apprentices 27 16 6			
	2116	5	6
Arrears of Subscription	35	14	0
Lecture Fees	47	5	0
Balance of Petty Cash due to Secretary	4	0	8
	£10,346	19	10

EXPENDITURE.	£	s.	d.
Life Members' Fund:—			
Investment	357	0	0
Benevolent Fund:			
Investment 413 14 6			
Gratuities 40 0 0			
	453	14	6
Government Securities, Investment	2000	0	0
Conversazione 51 18 11			
Pharmaceutical Meetings 3 15 3			
Sundries 3 1 0			
Repayments 9 9 0			
	68	4	2
Ditto to Secretary (Petty Cash) ...	2	6	11
House Expenses	4	18	2½
Rent, Rates, Taxes, and Insurance (including £50 to Secretary for Rent)	494	5	9
Alterations and Repairs	66	12	1
Fixtures and Fittings	33	7	3
Apparatus	17	8	1½
Museum	33	5	6
Library	38	15	1
Journals, Postage, &c.	599	10	3
Furniture	5	7	6½
Printing and Engraving	38	7	6
Advertisements	3	7	6
Stationery	2	17	5½
Postage	36	15	4
Carriage	1	17	11
Collector's Commission	32	15	7
Travelling Expenses	125	19	0
Salary to Secretary	250	0	0
Wages	163	1	8
Pension to late Secretary	112	10	0
Expenses of Society in Scotland ...	64	9	8
Board of Examiners	78	15	0
Professor of Chemistry and Pharmacy, including duties as Curator in his department, and payment of Assistant	300	0	0
Professor of Materia Medica and Botany, including duties as Curator in his department, and payment of Assistant	250	0	0
Subscription to Royal Botanical Gardens	21	0	0
Prize Medals, &c.	7	2	0
Law Costs (4 years' account to Executors of the late Mr. Brace)	154	17	6
Mr. Batterbury, Contractor, for Alterations, &c., on ac., £3380, appropriated & apportioned to the following accounts, viz.:—			
Laboratory 1455 0 0			
Fixtures & Fittings 970 0 0			
General Repairs ... 820 0 0			
Alteration of Lecture Hall (in part) 135 0 0			
	3380	0	0
Messrs. Lansdown, Architects, on account	50	0	0
Mr. Mayhew, Surveyor	52	10	0
Balance in Treasurer's hands	1045	18	4
	£10,346	19	10

We, the undersigned Auditors, have examined the Accounts of the Pharmaceutical Society, and find them correct agreeably with the foregoing statement, and that

as shown by the Books of the Society, there was standing in the names of the Trustees of the Society, at the Bank of England, on the 31st of December, 1860:

On Account of the General Fund, New 3 per Cents.	£2643	0	2
Benevolent Fund, 3 per Cent. Consols.....	5573	16	0
Life Members' Fund, 3 per Cent. Consols	1998	10	4

EDWARD CONSTANCE,
BENJAMIN HUMPAGE,
ARTHUR BOWDLER HILL,
JAMES B. BARNES, } *Auditors.*

March 1st, 1861.

In presenting to the Society their Annual Report, the Council desire to call the attention of the Members to the great and important changes which have been made in the arrangements for carrying out the educational and other objects for which the Society was established. These changes were referred to at the last anniversary meeting, and they had then been commenced. A long lease of the premises occupied by the Society having been obtained on very favourable terms, it was considered desirable that the £2000 bequeathed by the late Mr. Jacob Bell for "increasing the efficiency of the School of Pharmacy" should be applied to the building on these premises of a new Laboratory, and that other extensive alterations should, at the same time, be made, including the construction of a new Lecture Hall, the extension of the Museum and Library, and the provision of suitable accommodation for conducting the examinations under the Pharmacy Act. The Council had hoped that the cost of these alterations, although from their extent and nature necessarily involving a considerable outlay, would have been less heavy than has proved to be the case; but in the progress of the work extensive repairs were found to be required in other parts of the building, and these, together with an improvement which had to be made in the drainage, and the adaptation of suitable apartments for the residence of the Secretary, who previously lived away from the premises, have led to a much greater expenditure than was at first contemplated. The Council believe, nevertheless, that when all these improved arrangements have been brought into full and active operation, there will be no reason to regret the outlay, and they trust the Members generally will co-operate with them in endeavouring to make the increased accommodation provided in the Institution the means of promoting the objects and extending the usefulness of the Society.

THE LABORATORY.

The circumstances which led to the construction of a new Laboratory were alluded to in the last Annual Report. The old Laboratories had been formed soon after the establishment of the Society, and had been extended from time to time as the school increased; but for several years past they were found to be inadequate to the requirements of the progressively increasing number of the students, while they admitted of no further extension, and much inconvenience was experienced in consequence of their being distributed through different parts of the building, where efficient ventilation was impracticable, and from whence the emanations inseparable from laboratory operations were, to some extent, diffused through the whole of the premises. In the new Laboratories all these evils have been entirely obviated, to the manifest advantage of the health and comfort, not only of those who are daily occupied in laboratory work, but also of all the inmates of the house. The Laboratories being now brought together at the top of the premises, where light and ventilation are abundantly provided, with every requisite for the convenience of students, and where there is ample space for a large class, it is confidently anticipated that at no distant period this department will, under the arrangements which have been adopted, yield such a return to the Society as will fully justify the expenditure incurred in its organization. The Council have devoted their

anxious consideration to the best means of ensuring this result, and although from the necessarily great expense attending the laboratory course they do not think it practicable to make the Laboratory a source of much pecuniary profit, yet they trust that, under the supervision of the Committee which is appointed for that purpose, it may be made to yield a fair interest on the capital invested. This result, however, can only be attained by increasing the number of pupils, and the Council hope the Members will aid them in promoting so desirable an object, for the accomplishment of which facilities are afforded by the complete and extended accommodation provided in the new Laboratories. The concentration in one large suite of rooms of all the arrangements connected with the instruction of this class, instead of their distribution, as formerly, in different parts of the building, presents a great advantage in affording the means of securing the constant presence of at least two assistants, who are engaged under the superintendence of the Professor in directing and assisting the pupils in their studies, a provision which, it is believed, will add to the efficiency and popularity of the school.

THE BOARD OF EXAMINERS.

Very important improvements have been made in the arrangements for conducting the examinations under the Pharmacy Act, and the system adopted by the Board in its present fully organized condition, will, it is believed, bear comparison with that of any other examining body having similar objects in view. When the thoroughly practical as well as scientific and searching nature of these examinations becomes more widely known, the certificates which are granted to the successful candidates will acquire increased value, and will be more generally considered essential as a guarantee for professional qualification, not only by those employing assistants, but also and especially by the medical profession and by the public at large.

THE BYE-LAWS.

Upon a careful examination of the provisions in the bye-laws, and a reference to the practical working of the existing regulations, relating to the income of the Society, your Council have come to the conclusion that some alteration should be made in the terms of contribution as applied to those hereafter to be admitted into the Society, in order to ensure a permanent income adequate to the maintenance of the institution in a fully efficient state.

Some changes are also considered requisite in other parts of the bye-laws. When the Pharmacy Act came into operation in 1852, it was thought desirable to admit to a participation in the privileges conferred by the law, all those who were engaged in the business previous to the passing of the Act, if they desired, by joining the Society, to avail themselves of it. Admission, on the terms then specified, was, however, limited to a period of one year, during which time it was thought that ample opportunity would be afforded for all who were eligible, and likely to add to the influence and usefulness of the Society, to take the necessary steps for becoming Members. Many availed themselves of the offer so made, but it appears that many more were shut out by the limitation imposed by the bye-laws, in consequence of their not having received the information in time, or from some other cause. Applications are therefore frequently made for admission into the Society by persons who, from their age, long standing in the business, and the position they have acquired, may be considered to have strong claims for exemption from the necessity of passing the usual examination; and the Council are of opinion that it is desirable they should have discretionary power conferred upon them by the bye-laws to admit persons of this class into membership, on receiving certificates affording satisfactory evidence of the entire eligibility of the candidates.

In addition to these proposed alterations, the Council consider it desirable

that the provisions for the appointment of local secretaries should be more clearly defined, so that the selection of suitable persons should, as far as possible, originate with the Members resident in the districts for which the appointments are made, subject only to the approval of the Council.

THE JACOB BELL MEMORIAL FUND.

The contributions to this fund having now reached nearly to £2000, a deed of trust, vesting the property in the Society, has been prepared, although not finally settled; and it will be the duty of the new Council to complete the arrangements for the appropriation of the fund, and to direct the election of students, in accordance with the provisions of the trust.

THE BENEVOLENT FUND.

The Council would be glad to see a greater amount of interest manifested with regard to this important feature in the constitution of the Society. The establishment of a fund from which members of the trade who have fallen into adversity may receive relief in the hour of greatest need, was a prominent object of solicitude with those by whom the Society was founded. Considerable sums were formerly appropriated to this fund, and subscriptions are still received towards its support and augmentation; but these are less numerous now than they were in former years, and the fund, therefore, although it continues to accumulate, does so but slowly. Relief has been afforded from the fund in two cases during the last year, and there is reason to believe that in both these cases the assistance rendered was of essential service to the recipients.

THE EVENING MEETINGS.

The Council are desirous of directing the attention of Members to these meetings, in the hope that an increased number may be induced to contribute to their support, both by their presence, and also by supplying papers of a practical and scientific character. To the gentlemen who have contributed matter for discussion the Society is much indebted, and others are invited to follow their example. It is also proposed to have some lectures of a popular character on subjects relating to Pharmacy, with the view of adding to the interest of the evening meetings, and inducing a more numerous attendance at them.

Mr. PEDLER, in moving the adoption of the report, said it appeared at the first glance that the expenses of the Society during the year referred to in the financial statement were very heavy, but he thought it would not be difficult to prove that they had not been incurred without ample justification. The business of the Society having been carried on with a due regard to economy for twenty years, they had succeeded, by husbanding their resources and keeping down expenses as much as possible, to invest a large sum in the funds; and the present was considered a suitable time for endeavouring, by the expenditure of some of this money, to carry out more fully than hitherto the several objects of the Society, and to make the Institution in every respect worthy of the body they represented. Great as had been the expenditure last year, it was satisfactory to find that the balance was still on the right side. In making the recent alterations and additions to the building the Council had not incurred any debt, or involved themselves in any difficulty, and he thought they were entitled to the thanks of the Members for the care and attention they had devoted to the important work that had been done. Those who had attended the Conversazione on the previous evening could not have failed to be gratified with the appearance of the premises, affording as they do ample accommodation in every department, and they could but feel proud in belonging to so excellent an Institution. This was especially the case with regard to the spacious suite of laboratories, where ample accommodation was provided for students, who were enabled through the provisions made for them to acquire such a knowledge of the science, as well as the practice of pharmacy, as would enable them to take a highly

creditable position as useful members of their profession. If, in this age of progression, young men wished to raise themselves and their profession in public estimation, it must be by storing their minds with the knowledge which was so essential to success. This knowledge was becoming every day more necessary to them. In the carrying out of the recent Act of Parliament relating to the Adulteration of Food, who were better qualified to discharge the duties of analysts than well-educated and experienced Pharmaceutical Chemists? The contrast between the present state of the Pharmaceutical body and that of twenty-five years ago was remarkable. At that time there was no School of Pharmacy in this country, and those who were most anxious to advance themselves in their profession had to depend on chance for the means of acquiring their scientific knowledge. Then, with regard to their Museum, did it not contain an admirable collection of the products of nearly every part of the world? But well furnished as it was, there was still room for improvement and further additions, and for these the Council had made provision. Great as were the facilities afforded by English commerce, their Museum ought to be made the best of its sort in the world. He considered the improvements made in the premises a move in the right direction. It was absolutely necessary they should go forward, for see what was being done around them. In the City of London School, where there were about six hundred boys, there was a regulation that every boy should be taught Chemistry. Indeed, the public were becoming so generally instructed in this science, that those who called themselves Chemists would be surpassed by others if they did not avail themselves of the necessary means of instruction. Even in a pecuniary sense it was important. Look at the case of Mr. Perkin, who it appeared had been educated at the City of London School. By the cultivation and application of his chemical knowledge he had succeeded in discovering and producing those beautiful dyes which were now so fashionable, and by which so much money was being made. Then he might refer to the products obtained, through the application of chemical knowledge, in the distillation of coal, and their applications to machinery, and as sources of light. In fact, every day was bringing forth some new and valuable application of chemical knowledge. With regard to the proposed alteration in the bye-laws, he confessed that he was not favourable to the change if it could be avoided. He was rather attached to conservative notions, and thought those who had framed the laws in question could see then as well as we can now what was the wise and proper arrangement to make. In making the proposed concession to those who had declined the offer when previously made, he thought the Society would be departing from that high and straightforward course which they ought to pursue. It was understood that all future Members of the Society should have their qualifications tested by examination; and if this rule was relaxed, the character of the Society would suffer in public estimation. The desire which many who formerly held themselves aloof now manifested to join the Society, was a very favourable indication of the progress they were making; but it ought to induce a persistence in, rather than a deviation from, the principles which had enabled them to gain public confidence. With regard to the Jacob Bell Memorial Fund, he was glad to find it would soon be brought into operation. They must all feel as he did the loss of their friend on these occasions, when they used to look to him for advice and assistance. Partly through the aid Mr. Bell had afforded them, by his bequest of £2000, they had been enabled to complete and perfect the Institution, which he hoped would long continue to diffuse the benefits it was designed to confer. He had great pleasure in moving "that the Report just read be received and adopted."

Mr. Vizer seconded the motion for the adoption of the report. Although the outlay with regard to the laboratory was rather heavy, and was probably more than was at first calculated, yet every one must admire the fine building they now had, and be satisfied with its adaptation for the purpose for which it was intended. Last year he had made some remarks with reference to the pecuniary position of the school, and suggested that the laboratory ought to yield some return; which he thought might be obtained if the Council took the money part of it into their own hands. He had hoped that this part of the subject would have been more specifically referred to in the report, for although they were given to understand that some return might be expected, yet it did not appear that the mode of conducting the

laboratory had been changed. A circumstance had recently come to his knowledge which, although he felt a delicacy in doing so, he could not refrain from mentioning, as it confirmed him in the opinion that the Council ought to receive the laboratory fees, and pay the Professor, the assistants, and all the expenses. They all knew that one of the assistants had occupied that position for a great many years, and had contributed largely to the instruction of the pupils in the laboratory. His name could not fail to be identified with the tuition of the Pharmaceutical Chemists of the present day for years to come. Now this gentleman had recently applied for an increase of salary, but he was told that in consequence of its being found necessary to have two assistants constantly in the laboratory, he must not expect any further increase. He (Mr. Vizer) did not like to see an old servant turned off for the sake of a new one, and if this should be the result, he felt assured it would not contribute to the best interests of the Institution.

Mr. Urwick quite concurred with what had just been stated. He had been very sorry to find that the salary of the gentleman from whom he and others had derived so much of their instruction, was likely to be rather reduced than increased. He hoped this would not be allowed by the Council, but that any change would be in the other direction. The Council should take the funds into their own hands, and pay all the expenses.

Mr. Collins thought the last two speakers had shown a great want of tact, for it appeared they had a grievance to complain of, and, if so, they should have brought it forward in the shape of an amendment, or of a separate motion. Referring to the general state of the Society, he demurred to the opinion expressed to the effect that they were progressing. If progress had been made, he thought it had been down hill. They had been twenty years hatching a very small egg, for they were in no better position now than they were twenty years ago. All that had been done for them had been a very questionable benefit, and he doubted whether their position would be much improved unless some legislative enactment could be obtained giving them that status they wished to enjoy. He was by no means sure that this could not be done. In a conversation he recently had with a Member of Parliament—one who took an interest in such subjects—he had been met by the expression of a readiness to bring before Parliament any well digested measure, or plan, for making Pharmacy a distinct profession, the members of which should be protected from the interference of unqualified persons. He (Mr. Collins) would be glad to see some movement made in this direction. Under existing circumstances he did not see much objection to the proposed alteration in the bye-laws. If the Legislature were to pass a restrictive Act, of course every person in business at the time of the passing of the Act would be exempted, and it was only to this extent, as far as he understood, that the proposed alteration was intended to apply. They had been told that great benefits were already conferred on qualified men, and reference had been made to the Adulteration of Food Act; but he thought the benefit of being appointed analyst under this Act was very questionable. He concurred in what had been said with regard to their Museum, and thought the expenditure in reference to it justifiable. There was one point he did not quite understand, which was, that while the Journal was represented as a good property yielding a profit, the Society was not credited in the financial statement with any profits.

The Secretary explained, that as the Journal was given to the Members, the only way in which the benefits resulting from its being the property of the Society appeared in the balance sheet was that its cost to the Society was less than formerly by some hundreds of pounds.

Mr. Slipper, referring to the statement made by Mr. Vizer, considered that any grievance complained of by gentlemen who had been educated in the school, and who, therefore, must feel much interest in the progress of the Society, was deserving the attention of the Council. He knew nothing of the case referred to, but felt assured it would receive the attention it deserved.

Mr. Hooper said they must bear in mind that the gentleman referred to was not a servant of the Society, as he was engaged under an arrangement which the Council had made with the Professor, in order to relieve themselves from such responsibility. With regard to the Council taking the management of the laboratory, that was impracticable. They must delegate the management to some individual, and had

done so by putting it into the hands of the Professor, retaining, however, some amount of control in their own hands.

Mr. DEANE said, that some years ago the Council held the position with reference to the laboratory which it had been urged they ought now to occupy, but it had proved anything but profitable to them, and, therefore, they had handed it over to the Professor, retaining only such a control as enabled them to see that it was properly conducted. Under this arrangement it had gone on prosperously, the number of pupils increasing from year to year, and although the number then in the laboratory was not as great as they were able to accommodate, there had nevertheless been a larger number this session than in previous years.

Mr. HUMPAGE considered it very important that there should be well-qualified assistants in the laboratory, and that there should be one such always present. He was glad to find that there was a prospect of some pecuniary return for the large sums of money which had been spent there. With regard to the Journal, it appeared that it cost the Society less now than formerly to supply it to the Members; but he thought the cost might be still further reduced, and would suggest that it should be sold to the public directly from the Secretary and not through a bookseller, also that the advertisement part might be extended.

Dr. EDWARDS, having been a Member of the Council when the alterations which had been made in the premises were commenced, could speak to the anxiety which had been manifested by his colleagues that such expenses only should be incurred as were necessary for providing the required accommodation. He could now congratulate them and the Meeting on having a house adequate to the requirements of the Society, which had been obtained at a very moderate cost. He thought they had progressed greatly during the last twenty years. Much had been done for Pharmaceutical education. He could say from experience, having been both a pupil and an assistant in the laboratory, that the pupils derived great advantages at a very small cost. The effect of throwing the pecuniary responsibility connected with the laboratory upon the Professor, had been to relieve the Society from expenses which were annually incurred for keeping it up, and Members were therefore in this respect benefited by the arrangement. He hoped the Jacob Bell Memorial Fund, which nearly amounted to £2000, would be made up to that sum, and he called upon the Meeting to supply the deficiency, as the trust was about to be settled. He agreed with the President in his remarks with reference to the Benevolent Fund, in the regulations for the distribution of which there was certainly a defect, for cases frequently occurred of a most deserving character, but which were excluded by the terms of the bye-law. He thought the suggestion of having a separate fund deserving of further consideration.

Professor REDWOOD thought it desirable, as a statement had been made which seemed to imply one of the assistants in the Laboratory had been hardly dealt with, that he should make a brief statement of facts bearing upon this and upon other points which had been adverted to in the discussion. He was enabled to furnish some authentic data the possession of which would facilitate the formation of a correct opinion upon the points in question; and this he could the more readily do, as the whole subject had been recently most thoroughly investigated by the Council, with the view of adopting such financial and other arrangements as might be thought most consistent with the best interests of the Society. The laboratory class was first established in 1844; it had therefore been in existence sixteen years at the end of last session, and during the whole of that time it had been under his (Prof. R.'s) direction. For the first eight years of the time the arrangement was that the Council received the fees and paid all the expenses, including the remuneration of the Professor and assistants. The average rate of remuneration to the Professor during those eight years was £250 a year, and the payment of this, together with the other expenses of the laboratory class, left the Society out of pocket to the extent of about £100 a year, without taking into account the expenses of rent, taxes, repairs, water, &c. Complaints having been made on account of this annual tax upon the Society for keeping up the laboratory, it was proposed to the Professor that he should take the pecuniary responsibility connected with it entirely upon himself, conducting the class under the supervision of a committee, and making such profit as he could out of it. This arrangement was adopted, and

had been in operation for the last eight years, during which time the Society had incurred no expense on account of the laboratory, while the profit in the shape of remuneration which the Professor had derived, after paying the other expenses, had amounted to the average annual sum of £106. During the whole of this time the laboratory had been well supplied with students, and for several years past the numbers had been annually increasing—in fact, he had reason to believe it was one of the largest and best sustained classes in this country, for students who were engaged in laboratory work throughout the day. Although the class had increased, especially of late years, yet the profit to the Professor had not increased in the same proportion, in consequence of an augmentation in the expenses, arising, in part, from increased salaries to assistants. The gentleman on whose behalf a complaint had been made had filled the office of laboratory assistant for many years, and he entertained a high opinion of him, and had been anxious to further his interests in any way he was able, in proof of which it might be stated that he had recently taken considerable pains in endeavouring to improve the position and income of the assistants by getting them appointed Demonstrators. He (Prof. R.) thought there was no ground for the complaint made, as the gentleman referred to received a much larger amount of pecuniary benefit from the laboratory than any other individual, and was, in fact, much better paid than laboratory assistants usually were. He would have been glad to have been able to remunerate all the assistants better, but was limited by the means at his disposal. This was not an uncommon state of affairs in similar establishments. He had made numerous inquiries, and could not find any case in which a laboratory devoted exclusively to the instruction of pupils, upon the liberal scale and at the low fees now generally adopted, was self-supporting, or could be kept up without some extraneous aid beyond the fees paid by the pupils. Schools of this kind were either endowed, or supported by Government, or helped in some way, and still they afforded but a poor and precarious remuneration to those who had to perform the arduous work of teaching. There was probably no case in which a large laboratory class was conducted upon terms more advantageous to those originating it than theirs had been during the last eight years. Yet something more than this was asked for. A claim was put in on behalf of the Society for some return for the capital invested, and when arrangements were made that seemed to promise, through great economy in other respects, that some such return might be made, a complaint came from another quarter, indicating that it was no easy matter to satisfy all parties.

Mr. Vizer and Mr. Urwick explained that they had not had any direct communication with the gentleman whose cause they had advocated, and it must not be supposed, therefore, that the complaint came from that quarter.

Mr. Mason thought the gentlemen who had introduced this topic had done right, thinking there was ground of complaint, in openly expressing their opinion. It was much better they should do this, rather than retain an impression which might prove to be unfounded.

Mr. George Edwards thought there was a misapprehension on the part of some of the Members with regard to the proposed alteration of the bye-law. It was not proposed that they should admit all who were in business before the passing of the Act, on their claiming admission as by right, but only those who, from their position and the character of their businesses, would be considered in every respect qualified, and equally deserving of recognition with those who were already Members. It was considered that the number of these was sufficiently large to give them importance, and that it was desirable to have them within the pale of the Society rather than outside. It must not be forgotten that they would necessarily have been admitted to equal privileges with Pharmaceutical Chemists, if anything like a restrictive Act had been obtained from the Legislature. Some reference having been made to the Journal, and the possibility of increasing the profit from that source, especially by extending the advertisement part of it, he might observe that already there were as many advertisements as could be sent by post for the penny stamp, and the proceeds from this source nearly covered the cost of printing the Journal. Although it still cost the Society some hundreds a year to supply all the Members with a copy of the Journal, yet the amount was much less than formerly, and he thought it would not be wise to disturb the existing arrangements.

Mr. Bastick doubted the fact, which seemed to be assumed by those who advocated the proposed change in the bye-laws, that there were hundreds of good men outside who were anxious to be admitted into the Society. If it could be proved to be so, he would not oppose their admission to the benefits of the Institution, but he thought it would be found to be a mistake, and that there were very few such men who would be added to the Society under the proposed law. With regard to the observations made respecting the laboratory, he might state that the arrangement now in operation was made when he (Mr. Bastick) was a Member of the Council. The subject was well considered at the time; he believed the proposition to throw the pecuniary responsibility upon the Professor was made by himself, and he still considered it the best arrangement, although he was sorry to find it had not answered the Professor's purpose better. He could not understand how the Society was to be benefited by going back to the old system under which the laboratory had always been a source of expense. If it could be made remunerative, this result would be most likely to be attained by making the Professor, upon whose management and exertions so much must depend, personally interested and responsible. As to the complaint made about the payment of an assistant, they could not, of course, interfere between the Professor and his servant, but he was not sorry the subject had been broached, as it was always desirable, if there was a grievance, either real or imaginary, that it should be openly stated. In his opinion, the explanation given by Mr. Redwood had been perfectly satisfactory.

Mr. Breton was not favourable to the alteration in the bye-law for the purpose of admitting those into the Society who had refused to avail themselves of the offer when previously made. He thought, however, that some new arrangement with reference to the appointment of local secretaries would be very beneficial.

Mr. Thomas Herring said, when the Society was first established efforts were made to bring all the respectable portion of the Chemists and Druggists of the kingdom within its pale, and similar efforts were again made when the Pharmacy Act was obtained; but the door was then closed to the further admission without examination of Chemists who were in business before the Act. If it should be now found that they were in error in closing the door so soon, would it not be right for them to endeavour to rectify the error, especially as in doing so they would gain friends instead of making enemies? Of course they would only admit thoroughly well qualified men.

The motion was then put, and carried unanimously.

Mr. Stanford moved, and Mr. Breton seconded, a vote of thanks to the Council; and

Mr. Cornish moved, and Mr. Baxter seconded, a vote of thanks to the President; which motions were respectively put and carried unanimously.

The President briefly returned thanks on behalf of himself and the Council. He stated that the next business would consist in the appointment of Scrutineers to examine the votes for the new Members of Council, and these having been appointed, the Meeting was adjourned to Friday, the 17th.

ADJOURNED MEETING,

Friday, 17th May, 1861.

MR. MORSON, PRESIDENT, IN THE CHAIR.

The Scrutineers brought up their Report, as follows:—

We, the Scrutineers appointed at the Twentieth Annual General Meeting of the Pharmaceutical Society of Great Britain, do hereby certify that we have duly examined the voting papers committed to us, and report the following results:—

Voting papers allowed	629
Disallowed for informality ...	18
	647

Arnold 285	Collins 242	Herring..... 491	Sandford 456
Barnes 196	Edwards 472	Lescher..... 440	Savage 320
Bird 457	Garle 265	Mackay 548	Squire 559
Brady 431	Haselden 472	Meggeson..... 453	Stuart 173
Bower 190	Hanbury 572	Morson 578	Thomas..... 206
Bucklee..... 490	Humpage 134		

(Signed) THOMAS BINGE, *Chairman*
JOHN T. FENN
CHARLES C. TURNER
WILLIAM WINDLE
JN. WALLIS MASON
CHARLES JOHN RADERMACHER
CHARLES COLES
WM. HENDERSON BELL
JOSEPH KETTLE
G. B. FRANCIS
SAMUEL GALE
BENJAMIN M. TIPPETT
JOHN BARNARD

The following Members were therefore declared to constitute the Council for the ensuing year:—

COUNCIL.

BIRD, WILLIAM LIONEL, 42, Castle Street, Oxford Street
BOTTLE, ALEXANDER, 37, Townwall Street, Dover
BRADY, HENRY B., 40, Moseley Street, Newcastle
BUCKLEE, WILLIAM H., 86, New Bond Street
DAVENPORT, JOHN T., 33, Great Russell Street
DEANE, HENRY, Clapham
EDWARDS, GEORGE, Dartford
EVANS, HENRY SUGDEN, 52, Hanover Street, Liverpool
HANBURY, DANIEL BELL, Plough Court, Lombard Street
HASELDEN, ADOLPHUS F., 18, Conduit Street
HERRING, THOMAS, 40, Aldersgate Street
HILLS, THOMAS HYDE, 338, Oxford Street
LESCHER, JOSEPH SIDNEY, 60, Bartholomew Close
MACKAY, JOHN, 121, George Street, Edinburgh
MEGGESON, GEORGE, Wandsworth
MORSON, THOMAS N. R., 38, Queen's Square, Bloomsbury
SANDFORD, GEORGE WEBB, 47, Piccadilly
SAVAGE, WILLIAM DAWSON, Brighton
SQUIRE, PETER, 277, Oxford Street
STANDRING, THOMAS, 1, Piccadilly, Manchester
WAUGH, GEORGE, 177, Regent Street

There being only the requisite number of Candidates proposed for election as Auditors, the Chairman declared the following, who have been nominated and had signified their willingness to accept the office, duly elected:—

AUDITORS.

CARR, JOHN, 171, High Holborn
CONSTANCE, EDWARD, 37, Leadenhall Street
HILL, ARTHUR BOWDLER, 11, Little Britain
McCULLOCH, WILLIAM, 5, Coleman Street
PRESTON, JOSEPH T., 94, Smithfield Bars

A vote of thanks having been passed to the Scrutineers and to the Chairman, the meeting separated.

ORIGINAL AND EXTRACTED ARTICLES.

ON THE COLOUR-TESTS FOR STRYCHNIA, AND THE DIAGNOSIS OF THE ALKALOIDS.

Being the substance of part of the Croonian Lectures for 1861, *delivered at the Royal College of Physicians.*

BY WILLIAM A. GUY, M.B., CANTAB.,
Fellow of the College, and Professor of Forensic Medicine, King's College, London.

(*Continued from page* 561.)

THERE is still one point connected with the answer to the first of the four questions propounded in my first communication which requires to be considered.

The simple comparative experiments which I have described appear to warrant the conclusion that the colour-developing substances are best applied in the solid form; but it is quite possible that the quantity of these substances used in the experiments may sensibly affect the development of the strychnia-colours, I accordingly put this question to the test of experiment.

I placed four equal drops of the solution of strychnia in sulphuric acid ($\frac{1}{200}$ grain to the *drop*) on each of three white slabs. I added to the first group of four drops, bichromate of potash; to the second, peroxide of manganese; to the third, permanganate of potash: to the first drop, in each case, a minute fragment of the test, and to the second, third, and fourth drops, a larger and larger fragment. This simple experiment yielded the following results:—With the bichromate of potash I obtained a perfect result with the smallest quantity of the salt, but with the larger quantities only the characteristic primary colour, the last secondary colour, or the colour which the mixture assumes after exposure for one or two minutes, was yellow-brown instead of bright brick red. With the peroxide of manganese I obtained two perfectly characteristic results with the two smaller quantities, but with the larger quantities less characteristic secondary results. In the first two experiments with the smaller quantities the mixture assumed the usual clear bright brick red as the ultimate tint, while in the third and fourth experiments it continued for a long time to retain the second or mulberry tint. With the permanganate of potash the reaction was quite characteristic in the two experiments with the smaller quantities of the salt, but the third assumed, after short exposure, a pink, instead of a vermilion tint, and the fourth took on at once a rich red-brown tint, and, therefore, failed as a test.

It is evident, therefore, from these experiments, in which all the elements were equal, except the quantity of the colour-developing substance, that in order to ensure a successful and in every way characteristic result, we must operate with small quantities of the colour-developing reagents. We must use small fragments of the substance in question. If we think that we are dealing with such quantities of the alkaloid as the two-hundredth of a grain, we should use a fragment not exceeding the size of an ordinary pin's head; and this quantity, small as it is, should be reduced if we have reason to believe that the quantity of the alkaloid falls short of this small amount.

I am now in a condition to give a distinct answer to the first of the four questions which I undertook to examine. The best *mode* of applying the colour-tests for strychnia is to dissolve the alkaloid in the acid, and then to apply the colour-developing substance; and the best *form* in which the two elements of the test—the sulphuric acid and the colour-developing reagent—can be used is, the acid concentrated and the reagent in substance. This appears to be a fair inference from the experiments already detailed. But the experiments teach something more than this. They demonstrate the close dependence ot the experiments, if they are to prove successful and characteristic, on the apportionment of the quantity and strength of the reagents. The injurious effect of even moderate dilution of the acid with distilled water shows that it should be applied as the strong acid, and affords a reason for its employment in the most concentrated form; the failure, more or less complete, of a fragment of the colour-developing substance when dissolved in a drop of water, contrasted with the perfect success of its counterpart when applied in the solid form, is conclusive as to the superiority of the solid to the liquid state; and the perfectly characteristic results obtained with the colour-developing re-agents in small quantity, contrasted with the less characteristic results yielded by larger quantities, proves that the quantity of those reagents which we employ is by no means an unimportant element in the success of our experiments.

But though the combination of a concentrated sulphuric acid with the colour-

developing reagents in the solid state is that which promises the best results and is most likely to detect strychnia if present, it does not follow that either the moderate dilution of the acid or the use of the colour-developing reagents in solution may not give very characteristic results. Every one, indeed, who has been in the habit of showing the colour-tests for strychnia in the class-room must know that failures rarely, if ever, occur, whatever the mode and form of application of the tests. But it should be borne in mind that for class purposes it is usual to employ a quantity of the alkaloid much exceeding the two-hundredth of a grain contained in the drop of acid as used in the experiments I have been describing. Even with this small quantity of strychnia, solutions of the three soluble tests—bichromate of potash, ferricyanide of potassium, and permanganate of potash,—in the proportion of 10 grains to the ounce of distilled water, give rise, with occasional exceptions, to such a distinct development of the first colour, as to leave no doubt of the presence of strychnia, though the after colours were fleeting, variable, and wanting in distinctness. These experiments, then, justify the use of the colour-developing tests in solution as tests for strychnia, but it may admit of doubt whether in medico-legal cases we should be so fortunate as to deal with quantities of strychnia large enough to yield characteristic results with the reagents in a state of solution, however concentrated. I am of opinion, from the experiments I have detailed, as well as from the more general results of my experience of the strychnia-tests, that for medico-legal purposes the colour-developing reagents should always be added to the acid solution of the supposed alkaloid in substance, and not in solution.

My conjecture, that the success of class experiments in which the colour-developing tests are used in solution, depends on the use of a larger quantity of strychnia than the two-hundredth of a grain, was confirmed by actual trial; for I found that with these larger quantities, the tests in solution developed the same characteristic colours, or very similar ones, as those brought out by the same tests in substance.

2. The second question, namely, *Of the colour-tests for strychnia, which is to be preferred?* cannot be properly discussed without some preliminary inquiry into the true meaning of the colour-tests, and some description of the succession of colours which constitute those tests.

The colours produced by the action of the peroxides of manganese and lead, the bichromate of potash, the ferricyanide of potassium, and the permanganate of potash, on a solution of strychnia in strong sulphuric acid, are usually described as deep blue, passing to violet, purple, and red, and after long exposure, passing to light red.

This description of the colour-tests is sufficiently faithful for every practical purpose, and it applies to all the colour-tests and to all specimens of strychnia of the usual purity. It admits, however, of being simplified with advantage by specifying three principal colours passing into each other by insensible gradations. The first and most characteristic colour is a rich blue or purple, the second a claret, and the third a bright orange. The first colour may be compared to the bloom of the Orleans plum, the second to the mulberry, the third to the peel of the sweet orange. This is the succession of colours in the majority of experiments, but the exceptions to the rule are very numerous, and will be presently more particularly mentioned.

When the colour-developing test is applied to the solution of strychnia in strong sulphuric acid, and immediately stirred into it with a glass rod or spatula, the first colour is well marked, and lasts for from half a minute to forty-five seconds; the second colour during one, two, or three minutes; and the third colour for several hours or days. But when the acid solution is diluted with distilled water, or the colour-developing test is applied in solution, the first colour only may be produced, and that indistinctly and transiently, or

the test may wholly fail. It will succeed in developing all the colours only when the quantity of the alkaloid is considerable. It should also be understood that, even when the experiment is made in the manner just described, the results are by no means uniform. Some of the exceptions to the rule will appear in the issue of the comparative experiments now to be detailed.

I made two series of these experiments. I first compared the peroxide of manganese with the peroxide of lead. I then made a similar comparison of the three soluble salts, the bichromate of potash, the ferricyanide of potassium, and the permanganate of potash; and having selected from each group the best and most characteristic reagent, proceeded to compare the two so selected with each other.

I made the two series of experiments in the same way. I used in both cases a number of small slabs of white porcelain, equal drops of the acid solution of strychnia ($\frac{1}{200}$th grain to the drop), and equal fragments of the reagents.

In the first series of experiments I placed side by side two rows of porcelain slabs, twenty in each row; on each slab of the one row, a drop of the acid solution, and a fragment of the peroxide of manganese; and on each slab of the other row, an equal drop of the same solution, and an equal fragment of the peroxide of lead. I stirred the several fragments into the several drops of acid in the same way, and obtained highly characteristic results with the peroxide of lead in every instance; but with the peroxide of manganese there were three instances in which the first colour was imperfectly developed. In the other cases the first colour was very distinctly produced. But the action of the peroxide of lead was certainly more speedy and more delicate, as well as more constant, than that of the peroxide of manganese. The solitary advantage possessed by the peroxide of manganese consisted in the greater permanence of the third colour. But as this advantage is very small, as compared with the quickness, delicacy, and certainty of the action of the peroxide of lead, in developing the first and most characteristic of the strychnia-tints, I had no hesitation in selecting the peroxide of lead as the better of the two insoluble tests.

The experiment with the three soluble tests was conducted in the same manner with three rows of 20 slabs each, and it issued in showing the superiority of the permanganate of potash over the bichromate of potash and the ferricyanide of potassium in the richness and clearness of the first and most characteristic tint. The subsequent colours were also clearly brought out. But the permanganate of potash resembled the bichromate of potash in exhibiting less permanency in the third tint than did the ferricyanide of potassium. It resulted from a careful comparison of these three tests that the permanganate of potash is to be preferred to the other two.

There remained, therefore, to be submitted to a further comparative experiment the peroxide of lead, as the better of the first group of two, and the permanganate of potash, as the best of the second group of three.

The comparative experiment for this purpose was the exact counterpart of those just described. Twenty experiments with the peroxide of lead were compared with twenty similar experiments with the permanganate of potash. The result was decidedly in favour of the permanganate of potash, which gave in every case a clear rich blue colour, while the colour with the peroxide of lead was less clear and bright, being sometimes obscured by the colour of the portions not dissolved. In two of the experiments the result was not satisfactory.

I repeated these comparative experiments with several stains left by the evaporation of solutions of strychnia in benzole, and found the permanganate of potash to yield characteristic results where the peroxide of lead failed. I estimated the quantity of strychnia in these stains at less than the thousandth of a grain. The permanganate of potash acted characteristically in every instance.

Having thus ascertained the superiority of the permanganate of potash to the peroxide of lead, I made a final experiment with the three soluble colour-developing substances: the permanganate of potash, the ferricyanide of potassium, and the bichromate of potash. I took eighteen glass slides stained with deposits of strychnia, some from the solution of the alkaloid in benzole, and others from a solution of the acetate decomposed by the vapours of ammonia. I arranged the eighteen stains in groups of three, putting those of equal size together, and I noted the results at once by the position of the slides. All the spots were first treated with a single drop of strong sulphuric acid. The acid solutions were then treated with equal small fragments of the colour-developing substances, six with the permanganate, six with the bichromate, and six with the ferricyanide. In one group of three all the reagents failed. This experiment was, therefore, excluded. But the remaining five groups gave the following results:—

The ferricyanide of potassium gave faint indications of strychnia in two instances, and failed in three.

The bichromate of potash acted characteristically once, gave faint indications twice, and failed twice.

The permanganate of potash acted quite characteristically five times, producing a clear brilliant blue solution, changing to mulberry and to bright red.

In these last experiments I estimate the quantity of strychnia in the stains at about the $\frac{1}{1500}$ of a grain.

The answer to the second question—of the colour-tests for strychnia, which is to be preferred?—is, therefore, evidently in favour of the permanganate of potash. The remaining questions must be reserved for future consideration.

(*To be continued.*)

NEW FORM OF BURETTE.

BY MR. JOHN T. MILLER.

The burette described in the last number should be held, just above the bend, by a strong brass clamp lined with cork, which may be fitted to the rod of a retort stand. This will be sufficient, unless the instrument be very long, in which case a tin tube-holder, sliding on the same rod, may be applied higher up to steady it.

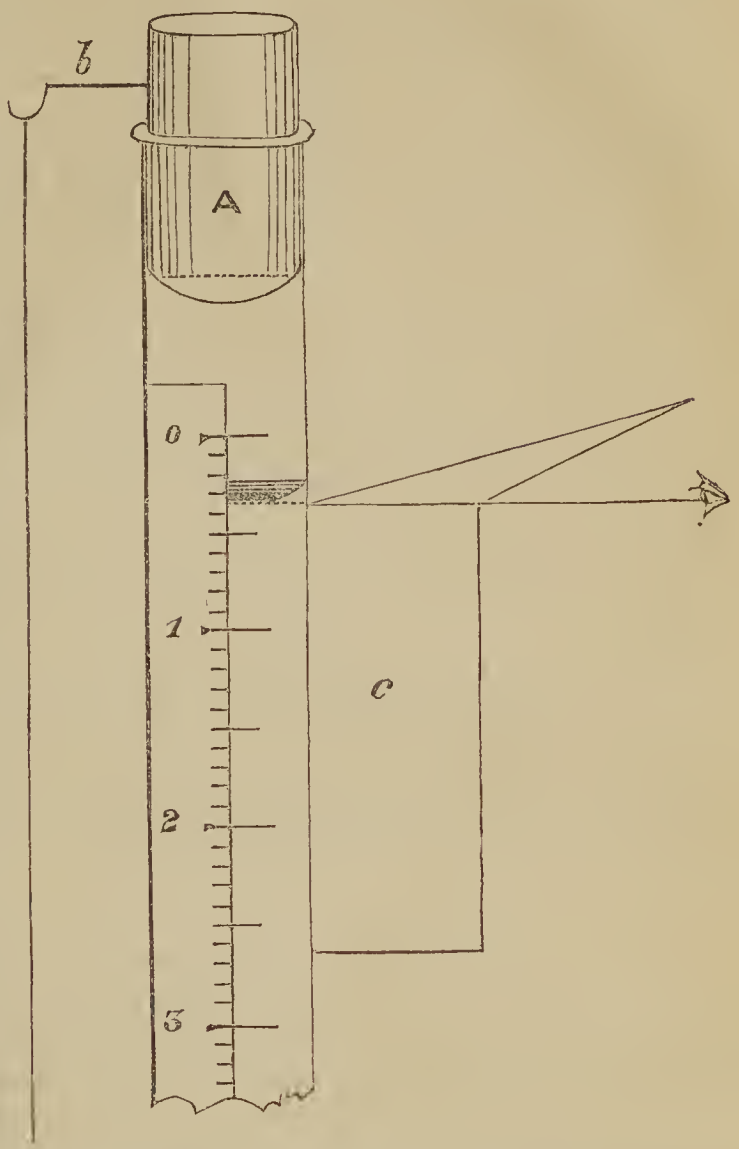
The plug can be secured preparatory to weighing in mercury for graduation, by heating it, rubbing it over with bees'-wax, and then replacing it in the warm socket.

The graduation may also be pretty accurately done by drawing off measured quantities of water.

For cubic centimetres a measure may be made of $3\frac{1}{2}$ inches of glass tube, $\frac{3}{16}$ths of an inch in the bore, by closing it at one end, widening at the other, and cementing it to a lead foot. After rinsing it out with distilled water, and inverting it for a few moments with the mouth on blotting paper, wipe the outside dry, counterpoise it, and weigh into it 15.42 grains of distilled water at 60°.8 F. Place it on a shelf in a good light, with a white card a few inches behind it, and make a fine mark on the glass at the bottom of the dark curve. The measure should always be placed on the shelf in the same position for reading off. Wash out the tube to be graduated with alcohol, and paste on it a long strip of writing-paper, broad enough to cover a fourth of its circumference, and so as to leave the right half of the side of the tube next the operator uncovered, when it is fixed before him in the clamp with the stop-cock to the right hand.

To get the correct vertical position a plummet is useful. It may be fitted to

the top of the burette by means of a bit of glass tube, shaped like *A*, which slips within it. Into this a cork is thrust, holding the hook *b*, from which is suspended a bullet by a foot or so of string. Having arranged the instrument before a window, with a sheet of thin white paper at a distance of twelve or fifteen inches as background, fill it with distilled water at the temperature of the room (which ought not to vary while the work is proceeding), and, after seeing that the horizontal limb is free from air bubbles, draw off the water to the place determined on for commencing the scale; let it stand a minute, and then, bringing the eye to a level with the surface, make a mark with a pen exactly at the point where the lower border of the dark curve meets the edge of the paper. A rectangular piece of wood, *C*, is handy for placing the eye at the proper height for reading off. Apply its edge lightly to the tube parallel to the margin of the paper, with the top at the level of the dark ring, then, the eye being so placed as to see the upper edge, lower the head until it just disappears. The next step, after rinsing the measure, and draining it a few seconds on blotting paper, is to draw off exactly a cubic centimetre of water. In doing this it will often happen that much less than a whole drop is required to fill up the measure. In that case let a small quantity flow out and hang from the end of the delivery tube, and take it off by touching it with the inside of the mouth of the measure. If it should stand on the lip, pass a fine wire through it along the side of the glass, which will cause it to run down. The exact measure being made up, allow a few moments for the water in the burette to collect; mark carefully as before, and repeat these operations until the required number of divisions have been made. Should too much happen to be taken, fill up to a little above the last mark; draw off exactly to the latter, and fill the measure afresh.



Having divided each space into two with compasses, the next thing to be done is to mark the divisions on the glass. To do this, hold the burette in the left hand, resting it against the edge of a table, and having provided a bit of brass tube that will slide nicely over it to act as a ruler, adjust the edge of the latter,—press the thumb on it to keep it steady, and, thus guided, make the line with a pencil-diamond or three-square file. If a file be used, the side applied to the ruler should be ground smooth.

The marking finished, wash off the soiled paper and replace it with a clean slip, and after it is thoroughly dry, divide and number it as shown in the cut. To preserve it, apply a solution of isinglass, and after drying, varnish it.

Sheffield, May 11th, 1861.

SEPARATION OF IRON FROM ALUMINA.

TO THE EDITOR OF THE PHARMACEUTICAL JOURNAL.

Sir,—Having been recently engaged in the examination of some kaolin found in this colony, with the view of ascertaining its quality and value as an article of exportation, and its comparative freedom from iron, I was induced to make a few experiments with the view of replacing the ordinary unsatisfactory method of boiling in potass in order to separate the alumina; and I now beg, through the medium of your Journal, to recommend the following:—

The mineral, after fusion (if required) with soda, is digested in hydrochloric acid, and the silica separated in the usual way. The filtrate, evaporated if there is a great excess of acid, and treated with nitric acid to peroxidize the iron, is mixed with a considerable quantity of water, and tartaric acid added. It is then supersaturated with ammonia, when, if very much alumina be present as in the examination of clays, part will be precipitated, which must be separated.

To the clear ammoniacal solution sulphide of ammonium is now added, when the iron is immediately precipitated as a sulphide, leaving the alumina in solution.

This process is founded on the facts that tartaric acid prevents the precipitation of alumina as it does of iron by ammonia, and that alumina is not precipitated as a sulphide.

I am, Sir, with much esteem, yours,

St. Kilda, near Melbourne, Australia. W. Johnson.

ARE WE PROGRESSING?—THE ANSWER.

"Hear me, for my cause, and be silent, that you may hear."

The perusal of Mr. Collins's letter last month afforded me a certain amount of pleasure and satisfaction, as I gather therefrom that he considers we are progressing, though but slowly; also, that he is a well-wisher to the Society, although, like a froward child, he has his own peculiar way of showing his affection, for, passing over the educational advantages in common with many others, which in my last and other communications I have, from time to time, pointed out, he seizes upon one feature in particular, which he clearly does not know the value of, and consequently cannot appreciate. Now, putting aside all superfluity of modesty, and all sentiment opposed to a matter-of-fact question, I boldly answer my own inquiry, and say unequivocally that we are decidedly progressing. Never in the best days had the Pharmaceutical Chemists such opportunities for education (that being the main and principal feature set forth at the time the Pharmaceutical Society was established) as at the present time, never have they been held in such estimation by the prescribing portion of the profession as at the present period, never at any time have they held so high a social position as now, and never have they been so well informed upon the subjects directly pertaining to their vocation, namely, Pharmacy, Chemistry, and Botany.

If they are not now looked upon as oracles, it is not that they are less wise, but the public more so; the man of medicine, of whatever denomination, is no longer in this country the mystery man, and the public generally are conversationally perfectly *au fait* upon the subjects of mesmeric influences, atmospheric influences, the inhalation of oxygen, the practice of allopathy, hydropathy, and homœopathy; the long and serious face, the pinch of snuff, and cane to tip of nose, will no longer pass current in the place of sterling information. Again, I believe that the amount of money paid as premiums with apprentices, taken in the aggregate, is as great as ever, and if the subsequent sums paid for laboratory and other instruction be taken into consideration, the total would be larger; indeed, very large sums are occasionally asked and paid to meet the views of those who devote a shorter time to actual apprenticeship, and these

apprentices, I assert and maintain, come from as good and well-to-do classes of society as ever they did; and, indeed, without something more than the ordinary education of former days, it would be folly, worse than folly, to attempt to become Pharmaceutical Chemists, and any young man who passes the examinations creditably at Bloomsbury Square must necessarily have had a liberal education, or be naturally quick in thought, diligent at study, and clever at execution.

It may, perhaps, be said that some of those who finish at the Square are not good men of business; it has ever been and ever will be so with a portion, and such would undoubtedly be the case under any tuition. Now, with all due respect to former generations, I have known those who would have been sorely puzzled—simple as it may appear—to put the terminations to a Latin prescription, although, in the ordinary sense, men of good business habits.

With respect to the remuneration for our outlay, our knowledge and experience, that certainly cannot be regulated by the Pharmaceutical Society, but must be adjusted by ourselves, collectively in districts, or individually; and your correspondent, I must say, has selected a very bad example to illustrate his case, for it is patent to every one having any experience in the matter, that the consumers of opiates, if not in affluent circumstances, and sometimes when they are, invariably travel from shop to shop, and do not hesitate to deviate even from truth to procure a reduction in the cost of the article; but if the profit be incompatible with the amount of business done and the number of customers, the real cause may in a great measure be traced, not to destructive competition among ourselves, but to the unfortunately prevailing fashion of substituting drops, tinctures, and syrups, for mixtures and draughts. The extent of our benevolent bumps and our means of gratifying the same must truly remain a matter of private consideration, and far from believing in the unwillingness of any, I feel they have only to be reminded in order to swell the list of givers. Once more I repeat, we are progressing, and shall continue steadily to do so, if we are but true to ourselves, the profession, and the public.

18, *Conduit Street, 6th May*, 1861. A. F. Haselden.

ARE WE PROGRESSING ?

This subject is brought before our notice not only by Messrs. Haselden and Collins, but in one of its aspects at least by the May leading article, "The Census."

If I understand rightly, the subject may be divided into three parts—viz. progression in numbers, in knowledge, and in position and remuneration ; but to the first of these my remarks will principally apply. With progression in numbers may be associated wealth and strength as a society, and there appears to be a doubt of our progress in this respect on the minds of our Council. Our income, it is said, is principally derived from the annual subscriptions of about two thousand Members, who pay a fee of one guinea; and as these drop off, it is feared there will not be sufficient entries to supply their place, and even if the number is kept up, that their composition fees will be insufficient to maintain the income of the Society. Here, it appears to me, are two points for consideration. Why should there not be a sufficient number of applicants for admission to counterbalance loss of older Members ? and why is the annual subscription superior to the composition fee ? Taking the last first, the fees amount to fifteen guineas before a student can become a Member of the Society. These fees, at five per cent. interest, bring in nearly sixteen shillings yearly, and the capital is in hand for ever, while an annual subscription of a guinea may cease to-morrow by death. Which is the more advantageous ? Unless the Council contemplate an annual subscription as well as the fees, which would be simply unjust, I believe the answer will be, that the fees are in the end most advantageous.

Why should there not be a sufficient number of candidates to counterbalance the retirement or death of older Members ? To effect this object, one of two things must be accomplished. Either the Legislature must make it imperative that all who claim to be Chemists and Druggists shall in future undergo an examination, or the Society must present such advantages to young men as to compensate, and more than compensate, for the expense and trouble of a voluntary preparation for

examination; for it would be unreasonable to suppose that, in the majority of instances, young men will be found willing to spend some months of their time, and probably forty or fifty pounds of their money, unless they can thereby reap a pecuniary benefit. The first of these propositions, whether, by further effort on our part, the Legislature can be induced to interfere, is for the consideration of the Council; but with respect to the second, we may all have our ideas, and give utterance to them. At present, I do not hesitate to say there is not sufficient recompense to induce the mass of Assistants to make the sacrifice. While they see unqualified Assistants in the houses even of our Examiners, getting in many instances better salaries than those qualified; when the public makes no difference between Pharmaceutical Chemist and Family and Dispensing Chemist; when knowledge is left entirely to be, like virtue, its own reward; what motive have they, in the majority of instances, for troubling themselves about the matter ?

There appears to be a proposal to receive into membership certain Chemists without examination. This would certainly not be progression. It would be a flagrant departure from the principles of the Society, and an injustice to those gentlemen who have borne the burden and heat of the day, as well as to those who have been at the trouble of qualifying themselves since. If these gentlemen did not enrol themselves with the Society at its formation, or at the time of the Pharmacy Act, *they* excluded *themselves* from the privilege of becoming Members without examination; and would it be worthy of the Society to throw open its gates unconditionally, merely for the sake of an addition to its numbers or income ? Such a proceeding would be likely enough to raise a similar opposition to that which caused the Society so much trouble and expense some years ago. No; let them have an examination, practical, without the theoretical, and let us, who have passed stringent examinations, see employers, Pharmaceutical employers in particular, object to Assistants who have not joined the Society. Let us, after our expenditure, see a little advance in our salaries above our previous ones, and let the examinations be more practical and less theoretical—more of the pestle and mortar, and less of the intricate chemical processes and delicate distinctions of parts of flowers totally unconnected with medicine—so that our knowledge may be permanent and useful, not read up and lost in a twelvemonth; so that not only those who have received the most liberal education, and have time and money at command, but the majority of us—that is, those who are working hard for a living—may be able to pass without necessarily leaving their daily employment for a length of time. That some attendance fee for the excellent lectures of Professors Redwood and Bentley should be charged, I cordially admit, for they present an advantage which places those who have the benefit of them much beyond others, and are only within the reach of a favoured few. There are certain things by which the Society might benefit us after passing the examinations, but which, being not so directly connected with the present subject, I will omit. I think, however, if a little attention were paid to these particulars, and a personal intimation of the same, with an invitation to enrol themselves, were occasionally sent to each Assistant or Apprentice whose address could be ascertained, our rate of progress with respect to numbers would materially increase.

With respect to knowledge, position, and remuneration, I am more inclined to adopt the words of Mr. Collins's last paragraph, than to put forth any views of my own. No doubt the art of Pharmacy is progressing, and when that *esprit de corps* he speaks of arises, we may hope for a better position in society, and better remuneration for our services than we now enjoy. At present, I fear, the case of two dozen powders for a shilling would find but too many parallels.

There is one other subject of which we have heard but little of late—that is, our long hours. In every direction we see Chemists and Druggists' shops open hours after most of their neighbours have closed, to the mental and physical detriment of all concerned; this too, in many instances, because a solitary individual refuses to conform to the wishes and comforts of his brethren. Can nothing be done to obviate this consequence of the want of spirit as a body, which would enable us to close our shops at reasonable hours? This would, indeed, be "progression," and a boon to both employers and employed.

Camberwell. A Major Associate.

THE APOTHECARIES' COMPANY *VERSUS* THE ROYAL COLLEGE OF PHYSICIANS.

(*Before Vice-Chancellor Sir* W. P. Wood.)

This case came before the Court upon a demurrer to an information filed by the Attorney-General, at the citation of the Master, Wardens, and Society of the Art and Mystery of Apothecaries of the City of London, for the purpose of obtaining a declaration that the defendants, the Royal College of Physicians, could not lawfully issue any license purporting to authorize the licentiate to compound and supply for gain the medicines prescribed by him, or in any other way to exercise the calling of an apothecary, or purporting to establish any new order of medical practitioners. An injunction to the same effect was also prayed. The defendants (the College of Physicians) had demurred to the bill, upon the grounds that there was no jurisdiction in a court of equity to restrain the act complained of, the remedy being by proceedings in a Court of Common Law, or by enforcing the penalties imposed by the Apothecaries Act of 1815 for practising as an apothecary without license; that the act sought to be restrained was legal, warrantable, and perfectly within the scope of the authority and privileges conferred upon the defendants; and lastly, that if the act was illegal, then it would be a mere nullity, to restrain which no injunction was required.

Mr. Roundell Palmer, Mr. Cleasby, Q.C. (of the Common Law bar), and Mr. Osborne appeared in support of the demurrer; the Attorney-General and Mr. Hobhouse for the relators in support of the information.

The information, which was filed by the Attorney-General at the relation of the Society of Apothecaries, stated the incorporation of the College of Physicians by royal charter in 1519, and certain statutes passed in the reign of Henry VIII., for confirming and regulating the privileges and authority of physicians in London. Ever since their original constitution the College had consisted of "fellows," and also of "*permissi*" or licentiates. The members of each class were equally physicians, and although there was a distinction between the two classes with respect to their relation to the College, as to the form of their diploma and admission into the governing body, no such distinction was apparent to the external world. The College had always prohibited its members from exercising the "illiberal" art of compounding and selling drugs for gain, and in one of its ancient statutes declared that if any one, after admission into the body of licentiates, should have sought his livelihood in the trade of a drug-seller, or by selling any wares whatsoever, he should, so far as in the College lies, be deemed to have "fallen away from the body of licentiates." The bye-laws of the College also required that persons before admission into the order of licentiates should adduce evidence of having renounced their connexion with the College of Surgeons or Society of Apothecaries (if previously members of either of them), and imposed a penalty of 20*l.* upon any licentiate who should share with any druggist the profit upon the medicine prescribed by him. The plaintiffs, the Apothecaries' Society, were incorporated by royal charter in the 15th of James I. (1617), with certain privileges as to the exercise by them of the mystery and faculty of an apothecary—consisting of the compounding and selling medicines. The effect of this charter was greatly to raise the position and character of the apothecaries, and they gradually acquired the right to give medical advice, and prescribe as well as sell the medicines compounded by them. This right was stated in the information to have been successfully vindicated against the College of Physicians in the reign of Queen Anne by one Rose, an apothecary. In 1815 the Apothecaries Act was passed establishing compulsory examination as a qualification for practising as an apothecary, and imposing a penalty of 20*l.* for every offence upon all persons who should "act or practise as an apothecary" without having obtained the certificate of the Society. The Act contained a saving clause as to the "rights, authorities, privileges, and immunities exercised and enjoyed by the Universities of Oxford and Cambridge, the College of Physicians, the College of Surgeons, or the Society of Apothecaries, except such as should have been altered, varied, or amended by the Act." The practical effect of this Act was to vest exclusively in the Society of Apothecaries and persons obtaining their license the right of supplying the medicines prescribed by them in medical cases. By the Medical Act of 1858 a general

medical council was established, consisting of representatives from the various medical bodies throughout the kingdom, with provisions for a registry of medical men of various classes and denominations. The information proceeded to state that the defendants had recently conceived the scheme of erecting the present licentiates into members of the College, and of establishing a new class of practitioners to be licensed by the defendants; that they intended that such new class should commence practice at an earlier age than, and be inferior in qualifications and attainments to, the present class of fellows and licentiates of the College, and that they intended to grant to such new class licenses purporting to allow them to act as apothecaries, or to compound and supply for gain the medicines prescribed by them. In pursuance of this scheme the defendants passed certain bye-laws on the 8th of August, 1859, regulating the election of fellows of the College who were to be excluded from the practice of pharmacy directly or indirectly. It was also provided that licentiates should be styled members of the College, and be alone eligible to the fellowship, the practice of pharmacy being also prohibited in the case of these members. Resolutions were also passed enabling the College to grant licenses to practise physic to persons who should have complied with certain examination tests and other requirements; no person so licensed to be empowered to vend, compound, or dispense any medicines except for patients under his own medical care. In April, 1860, the defendants, in pursuance of their scheme, passed a resolution to "grant licenses to practise physic to persons who shall not be restricted by any bye-law from supplying medicines to their patients, and who shall be entitled to register under the Medical Act as licentiates of the Royal College of Physicians of London." Bye-laws were subsequently passed to regulate the position of this new body of licentiates. In restraint of this scheme the plaintiffs had filed the present information, charging that the design of the defendants was contrary to law, beyond the power and authority of the College, and an invasion of the rights and jurisdiction of the plaintiffs, and that it was a matter of great importance to the public that the defendants should not issue licenses by which an apparent authority would be given to the licentiates to enter on a course of practice which would render them liable to the penalties imposed by the Act of 1815. To this information the defendants, the Royal College of Physicians, demurred.

Mr. Roundell Palmer, Mr. Cleasby, Q.C. (of the Common Law bar), and Mr. Osborne, in support of the demurrer, contended that the act sought to be restrained by the information was legal and warrantable, and entirely within the scope of the authority and privileges vested in and exercised by the defendants under their charter and Acts of Parliament, and that there was no jurisdiction in a court of equity to interfere in the matter.

The Attorney-General and Mr. Hobhouse, for the relators, in support of the information, contended that there was ample jurisdiction in a court of equity to restrain either the one or the other of these corporate bodies from exceeding, transgressing, or unduly extending the authorities conferred upon them by the Legislature. The Act of 1858 had recognized and assigned to each branch of the profession its distinct powers and sphere of action, and it was a fraud upon that statute for the defendants to create, in violation of their own bye-laws, a new body of practitioners altogether unknown in the profession.

The Vice-Chancellor (without calling for a reply) said that the demurrer must be allowed. The question arose upon a resolution passed by the College of Physicians to issue licenses which, on the face of them, enabled the licensees to dispense physic so long as they complied with the bye-laws of the College. The information was filed to restrain this contemplated act, and it was said that the College had restricted themselves by their own bye-laws, which expressly prohibited any of their members from taking upon themselves to vend and dispense drugs. It was also urged that there was in existence another body, the Society of Apothecaries, with certain definite functions, who were authorized as an independent body to issue certificates for the business and practice of an apothecary, there being also the Royal College of Surgeons, who had at various times obtained charters from the Crown. In this state of things it was contended that the Medical Act of 1858 was framed for the purpose of protecting the public as to the practice of medicine, of securing to each branch of the profession the domain parcelled out to them, and confining prac-

titioners to their several departments, according to their qualifications ; that each practitioner was to be enrolled under the certificate hitherto obtained by him, and that "licentiate" was to mean licentiate as already constituted without the accession of any new character. Then it was said that it was a fraud upon the Medical Act to create any new body of licentiates, and a fraud of such a nature as to call for the protection of the public by the intervention of this Court, and, further, that the jurisdiction of the Court to restrain any such act and to enforce the compact with the Legislature was plain. But to support this argument it was necessary to assume that the *status* of licentiate was definitely fixed, and must now, after the Medical Act, 1858, be taken as stereotyped and bound for ever by the former conditions and restrictions. This point was put very definitely in the bill. But what were the conditions imposed by the bye-laws of the College ? They might be divided into two classes—conditions precedent, as to the capacity and education, &c., of the candidates ; and conditions subsequent, as to compliance with the bye-laws (restricting the vending of drugs, &c.) after receiving the license. What evidence, then, was there that these conditions were to remain unalterably fixed, as contended for by the plaintiffs ? On the face of the Medical Act there was nothing to that effect—nothing to restrict the bye-laws to their existing state. How could it be contended that the College of Physicians were not to have full power to modify, from time to time, the qualifications required for admission into their body, with the control of the general council ? The only point on which the Legislature interfered in this respect was that particular theories—such as homœopathy, mesmerism, and the like—were not to act as disqualifications. The real question was how far the design of the defendants was a fraud upon the Legislature, and how far they were precluded from altering their own bye-laws. Their original charter admitted the whole domain of physic within its purview. Not only "physic," but surgery was included, and its effect was to throw the universal medical science under the control of the College of Physicians. Up to the 15th of James I. no one could have disputed the right of the College to deal with the question of selling medicines, and to revoke any bye-laws made by them upon the subject. It might be observed that the very existence of such a bye-law implied that it would have been the custom of physicians to deal in drugs but for such a restriction. No doubt, considerable inconvenience was occasioned to the public from the restriction, and this gave rise to the apothecaries and their incorporation by James I. The apothecaries, from the very humble position of grocers and mere drug-sellers, gradually acquired greater knowledge as to the properties of drugs and skill in their administration. They were accordingly incorporated by charter from James I., with certain privileges to themselves and restrictions against others. It could not be maintained for an instant that this charter had in any way interfered with the privileges of the College of Physicians granted by charter and confirmed by statute. From the time of Henry VIII. down to 1815 it was not possible to suggest a doubt that the College might have relaxed any of their bye-laws, including that which restricted the sale of drugs. Then came the Apothecaries Act of 1815. It was contended that the saving clause (sec. 29) did not preserve to the College the right, which existed before the Act, of granting licenses to practise physic divested of the restriction contained in their bye-laws. To say the least, the matter was far too doubtful to induce the Court to restrain a public body acting *bonâ fide* and in the belief that they were not exceeding their functions. His Honour then adverted to the case of surgeons dispensing medicines and recovering for them. There was no express repeal of the privileges of the College of Physicians, but, on the contrary, an express saving, and, unless the two things were so absolutely inconsistent that one of them must of necessity be excluded, he could not come to the conclusion that the privileges vested in the College were abrogated by section 20 of the Apothecaries Act (imposing a penalty of 20*l.* upon any one acting or practising as an apothecary without the license of the Society). His Honour then proceeded to consider the Medical Act of 1858. It had been contended that as the Legislature must have been aware of the previous *status* of licentiates, the creation of a new body of licentiates would be a fraud upon the Act. But until 1858 it was clear that the College had full power to create that new body. There was not a *scintilla* of evidence on the face of the Act of an intention to deprive any one of the medical

bodies of their power to alter their bye-laws, so long as they kept within the limits of their charter. The only grievance alleged in the information was that the defendants were elevating the old licentiates into members of the foundation, as it were, and creating a new body inferior in qualifications to the former. The question, however, returned to this :—Had the defendants authority to do this act? The information did not state that this new body would be apothecaries, but "to some extent a class of apothecaries." In his view of the case no possible amendment would help the information. Assuming, for the moment, that the plaintiffs would have a right of action against these new licentiates, who took their licenses with knowledge of the Act of 1815, still the College of Physicians would not degrade their licentiates for selling drugs, and the worst that would happen would be that they might have to obtain the certificate from the Society of Apothecaries. As to the argument of public injury arising from the harm done to these young men who accepted the licenses from the College, and were consequently deceived, he confessed that he did not attribute much weight to it. The legal maxim, "*Volenti non fit injuria*," would apply to such a case. In conclusion, there was not a shadow of a pretence for saying that down to 1815 the privileges originally conferred upon the College of Physicians had been in any way abrogated. The Act of 1815 did not, in his opinion, prevent the College from altering their bye-laws, and clearly the Act of 1858 had not that effect, so long as they kept within the limits of their charter. Upon these grounds the demurrer must be allowed, and it was not a case in which any good could be done by granting leave to amend.

ALLEGED POISONING BY ARSENIC.

An inquiry has taken place before Mr. Lovegrove, coroner, at the Union Workhouse, Cheltenham, on the body of a child, supposed to have been poisoned by arsenic. Dr. Bird, who made a *post-mortem* examination of the body, gave evidence to the following effect:—Some mucous from the duodenum and stomach was mixed with distilled water and hydrochloric acid, in which a piece of clean copper wire was placed and the mixture boiled. The copper wire became coated with an arsenical deposit. Portions of the viscera were then cut in small pieces and boiled with distilled water and potash, hydrochloric acid was then added and the mixture boiled with another piece of copper wire, which also showed the presence of arsenic. To a portion of the same fluid was added ammonio-sulphate of copper, which gave a bright green colour. To another portion of the same fluid, the addition of ammonio-nitrate of silver gave a "slight lemon yellow colour" precipitate. A portion of the duodenum was then boiled with water and hydrochloric acid, in which was placed a piece of bright copper wire which became covered with a white coating, indicating arsenic. The wire was afterwards dried and placed in a tube and heated, the smell of arsenic being very distinct. From the above experiments Dr. Bird had no hesitation in saying that the stomach contained a quantity of arsenic.

Mr. Alfred Sanders, surgeon, stated that he had tested a portion of the stomach by Reinsch's test, and that the copper soon became covered with a coating of arsenic. He tried several other tests giving unmistakable evidence of the presence of arsenic.

At the request of the jury the inquiry was adjourned in order that the parts said to contain arsenic might be analyzed by Mr. Horsley, analytical chemist, who described in detail the experiments he had made, from which he arrived at the conclusion that arsenic was not present in the body, and that there were no real grounds for the supposition of poisoning by that agent. After some questioning by the coroner, both Dr. Bird and Mr. Sanders acknowledged that they had been mistaken in the conclusions they had drawn from their experiments. The jury returned a verdict of death from natural causes, and desired to append an expression of "regret and astonishment that both Dr. Bird and Mr. Sanders had originated a charge of so serious a nature, and which had no foundation in fact."

MISCELLANEA.

Death from the Explosion of Gunpowder.—An inquest has been held before Mr. Brett, at 53, Gloucester Terrace, Hyde Park, on the body of Mr. J. Browning, aged 77, who died from the effects of an explosion of gunpowder at his residence.

From the evidence of one of the witnesses, W. Dale, who was the first to enter the apartment, the deceased was found lying in front of the fire, with his head by the fender, live coals scattered about the room, and the carpet on fire. The remains of a gunpowder can were found under the grate. Mrs. Browning, a short time previously, had left him reading the paper in bed. From the evidence of the last witness, it appeared that deceased had at one time kept a box containing gunpowder under the bed, but this had been removed by order of witness. He had also various chemicals in his room. The jury returned a verdict of accidental death by gunpowder explosion.

Eruption of Inflammable Gas.—Near the Featherstone station, about three miles and a half from Pontefract, and five miles and a half from Wakefield, boring for coal has been in progress for some time, and has reached a depth of 140 yards from the surface. At this depth the boring was advancing through a thick layer of blue sandstone, which overlies the coalbearing strata throughout a wide area in this district. On Saturday, April 13, while the borers were at work, a strong smell of gas was perceived, and suddenly an eruption took place, which threw the muddy water from the bore-hole about 30 feet into the air. This continued, and put an end to the boring. Subsequently, some one applied a light to the gas, which ignited. The gas has continued burning, but with diminished flame. The phenomenon is thus explained by the Rev. W. R. Bowditch, of Wakefield, in a letter to the *Times*: "The iron tools used for boring make a hole in the earth a little larger in diameter than a man's arm, and this hole becomes filled with water from the various strata pierced by the borer. In the blue sandstone there was stored a quantity of gas produced from the coal beneath, and, owing to the close nature of the superincumbent mass, that gas existed under great pressure. The borer's tool penetrated this stony reservoir of gas, and instantly it forced its way up the bore-hole, and carried onward part of the water which obstructed its exit. The gradual action of the bubbling water has removed some of the surface soil, and hence the visitor sees a hole full of water about ten feet across, part of which is in violent ebullition, owing to the escape of gas, which burns with a flashing and variable flame."

Clay in Foreign Paper.—Professor Penny, of Glasgow, in a letter to the *Times*, of May 22nd, gives the following results as obtained by him from a chemical examination of various kinds of foreign paper.

In several samples of British paper a notable quantity of sulphate of lime was found.

Paper.		Amount of Clay.
Cream-laid,	12 lb. per ream	29 per cent.
Ditto,	14 lb. "	$31\frac{1}{4}$ "
Ditto,	16 lb. "	$33\frac{1}{2}$ "
Ditto,	18 lb. "	31 "
Demy printing,	16 lb. "	26 "
Ditto,	18 lb. "	$30\frac{3}{4}$ "
Ditto,	20 lb. "	29 "
Double-crown printing,	14 lb. per ream.....	14 "
Ditto,	18 lb. "	18 "

A New Canadian Dye.—Professor Lawson exhibited specimens of a new dye of great richness, prepared in the Laboratory of Queen's College, from an insect, a species of coccus, found for the first time last summer on a tree of the common black spruce (Abies nigra, Poir) in the neighbourhood of Kingston. This new dye closely resembles true cochineal, a most expensive colouring matter capable of being produced in warm countries only, and which is used to give a fine and permanent dye in red, crimson, and scarlets, to wool and silk. Unlike cochineal, the new dye discovered at Kingston is a native Canadian product, and capable of being produced in temperate countries. Having been but recently observed, a sufficient quantity has not yet been obtained for a complete series of experiments as to its nature and uses; but the habits of the insect, as well as the properties of the dye, seem to indicate that it may become of practical importance. In colour it closely resembles ordinary cochineal, but having rather more of the scarlet hue of the flowers of Adonis autumnalis, and no doubt other shades will be obtained. The true Mexican cochineal is now being cultivated in Teneriffe and other vine-growing countries of Europe and Africa, with such success as to displace the culture of the grape-vine; yet the directors of the East India

Company offered in vain £2000 for its introduction into India.—*Annals of the Botanical Society of Canada.*

Chloroform in Poisoning by Strychnia.—Dr. M. Schuppert, of New Orleans, publishes a case of the successful use of chloroform by inhalation, in poisoning by strychnia. The patient, a medical man, had accidentally swallowed about a grain of strychnia. The spasms, which are described as fearful, were readily subdued by the chloroform; but it was found necessary to keep the patient constantly under its influence for many hours. About six ounces of chloroform were used in less than six hours.—*Medical Times and Gazette, May 11th.*

Accidental Poisoning by Arsenic.—An inquest has been held at Kingsland on the body of Daniel Smith, an artificial firework maker. It was stated in evidence, that the deceased had been in the habit of taking cream of tartar as an aperient, and kept arsenic, which was largely used in his business, in the same box with the cream of tartar, of which he intended to take a dose, but by mistake swallowed a large quantity of arsenic. The usual antidotes were administered, but the deceased continued to linger in great pain until death terminated his sufferings. The jury returned a verdict of "Accidental death."

Poisoning by Prussic Acid.—An inquest has been held by Mr. Bedford on the body of Susan Berridge, aged 32, residing at 3, Upper Eaton Street, Pimlico, who died from the effects of prussic acid. Numerous witnesses were examined, but their testimony threw no additional light upon the subject. The jury therefore returned the following verdict:—"That deceased came by her death from prussic acid, but there was no evidence to show how or by whom administered."

BOOKS RECEIVED.

Ale, Wine, Spirits, and Tobacco. A Lecture delivered before the Leicester Literary and Philosophical Society January 7th, 1861. By John Barclay, M.D., &c. Second Edition. London: Bosworth and Harrison, 215, Regent Street. 1861.

Ourselves, Our Food, and Our Physic. By Benjamin Ridge, M.D., F.R.C.S., &c. London: Chapman and Hall, 193, Piccadilly. 1861. 8vo, pp. 202. (From the Publishers.)

TO CORRESPONDENTS.

R. B. (Glasgow).—*Tincture of Arnica.* Vol. xiii., page 588.

A. M. P. S.—*Syrup of Superphosphate of Iron.* Vol. i. (second series), page 497.

A Reader (Leeds).—There is no law to prevent the manufacture of spirit of nitre from methylated spirit, but the use of the latter, in the place of pure spirit, in any preparations of the Pharmacopœia, has been prohibited by the Royal College of Physicians. See vol. xvii., page 355.

P. B. P. (Hackney Road).—*Oleum Morrhuæ cum Quinâ.* Vol. xiv., page 427, and vol. xv., page 239.

J. A. (Peterboro').—(1.) Vol. viii., page 422. (2.) Mucilage of tragacanth scented according to taste.

"*Libra.*"—Hooper's *Medical Dictionary.*

A. C. K.—See vol. xiv., page 207.

Rosine, M. P. S.—We think the preparation with the label referred to would not be considered liable to the duty.

Tottenham.—The designation "65 *over proof*," as applied to spirit of wine, means a spirit 100 measures of which mixed with 65 measures of water will form proof spirit of sp. gr. .920. Such a spirit would contain about 91 per cent. of alcohol, by weight.

G. K. (Banbury).—It will be seen by an advertisement in the present number, that Bentley's *Manual of Botany* may be now obtained through any bookseller.

Several communications are omitted this month for want of space.

Instructions from Members and Associates, respecting the transmission of the Journal, before the 25th of the month, to the Secretary, Elias Bremridge, 17, Bloomsbury Square, W.C.

Advertisements (not later than the 23rd) to Mr. Churchill, New Burlington St. Other communications to the Editors, 17, Bloomsbury Sq.

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